THE GEOGRAPHICAL JOURNAL

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NOTICES

PROGRAMME OF MEETINGS

Monday December 18 *at* 8.15 *p.m.*
LATEST EXPLORATIONS IN BRITISH ANTARCTICA. *By V. E. Fuchs*

CHRISTMAS MEETINGS FOR YOUNG PEOPLE

Thursday December 28 *at* 2.30 *p.m.*
PRAIRIE WINGS and BRUMAS. *Films with talk by Edward Hindle, F.R.S.*

Monday January 1 *at* 2.30 *p.m.*
A BIRD EXPEDITION TO THE CANADIAN ARCTIC. *Film with talk by Peter Scott, M.B.E., D.S.C.*

Admission to the Christmas Meetings will be by ticket only, obtainable from the Society. Applications to be received not later than December 15.

AN EXHIBITION, "BIRD TRAVELLERS", on bird migration, will be open from December 28 to March 1 (inclusive) during the Society's usual hours.

Thursday January 4 *at* 3 *p.m.*
SOME NEGLECTED ASPECTS OF GEOGRAPHY. *By Professor L. Dudley Stamp*
Joint Meeting with the Geographical Association and the Institute of British Geographers

Friday January 5 *at* 5 *p.m.*
THE SENSORY BASIS OF BIRD NAVIGATION. *By G. V. T. Mathews*
Joint Meeting with the Institute of Navigation

Monday January 15 *at* 8.15 *p.m.*
Subject and speaker to be announced later.

Monday January 22 *at* 5 *p.m.*
THE ORIGIN OF THE BROADS. *By J. N. Jennings*

Thursday January 25 *at* 7 *p.m.* (at the Royal Photographic Society)
THE PRACTICAL APPLICATION OF PHOTOGRAMMETRIC SURVEYING. *By P. G. Mott*
Joint Meeting with the Royal Photographic Society and the Royal Institution of Chartered Surveyors. **Admission by special ticket.**

Monday February 5 *at* 5.30 *p.m.*
INDIAN SCENES. *Kodachrome films with commentary by Colin Cleghorn*

Monday February 19 *at* 8.15 *p.m.*
DANISH EXPLORATIONS IN PEARYLAND, 1948–50. *By Count Eigil Knuth*

Light refreshments for Fellows and their guests will be served in the New Map Room after the Evening Meetings. Fellows are reminded that, unless special application is made, only one guest may be brought to Evening Meetings.

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The House of the Society is open from 9.30 a.m. to 5 p.m. on weekdays and from 9.30 to 1 p.m. only on Saturdays. The Library is open for the exchange of books from 7.30 to 8 p.m. before Evening Meetings and from 5 to 6 p.m. on other Mondays during the Session. The House will be closed for the Christmas holiday from Saturday December 23 to Tuesday December 26 inclusive.

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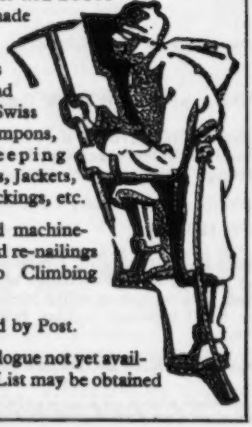

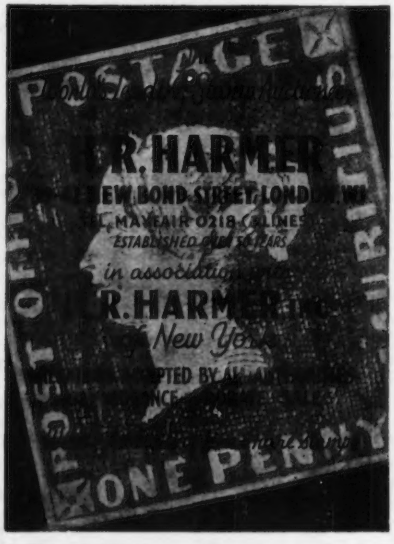

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The Publishers of *The Geographical Magazine* announce that rising costs have compelled them to increase its price from 1/6 to 2/– a copy and the subscription rate from 20/– to 27/– a year. The new prices came into force on October 1st, 1950.

The special facilities offered to Fellows of the Royal Geographical Society whereby subscriptions may be entered at a reduced rate are continued, the new rate being 21/– a year post free to any address. Current subscribers will not be asked for any adjustment to the sum they have already paid but will be notified of the new price when their subscription falls due for renewal. New subscribers are invited to place their orders direct with the Publishers (and not through the Society), forwarding the appropriate remittance in sterling or in local currency at the ruling rate of exchange.

The general public have already shown, by maintaining their purchases of the Magazine, that they endorse a decision which increases price instead of lowering standards and continues the policy of improving both quality and quantity. While colour-plates, for example, have increased from 26 in 1938 to 126 in 1950, the size of the Magazine is now being augmented and with it the number of illustrations. There is abundant evidence that the carefully-selected plates and specially-drawn maps accompanying articles in the Magazine are regarded as invaluable aids to teaching and learning geography in schools and Geographical Societies all over the world.

Moreover the articles themselves, though not directed to the geographical expert, are often written by distinguished geographers and invariably by people with first-hand knowledge of their respective subjects. Thus the Magazine has published, in the recent past, articles by Professor E. G. R. Taylor and Professor Dudley Stamp, as well as by members of the staff of the Royal Geographical Society; and has featured exclusive articles by members of the Norwegian–British–Swedish Expedition to Queen Maud Land.

These latter articles exemplify the direct help given by sales of the Magazine to the promotion of geographical exploration and research through the Geographical Magazine Trust Fund, to which one half of its profits are assigned in virtue of a legal obligation undertaken by its founders in 1934. From this Fund the Trustees, who have a completely free hand in making grants to persons and organizations of any nationality in any part of the world, allocated a first contribution of £2000 towards the cost of the Queen Maud Land Expedition.

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A few contributors of special interest to GEOGRAPHICAL JOURNAL readers:
Professor L. Dudley Stamp, C.B.E. (writes on Asia); Professor Sir D. Brunt (Meteorology); John Ramsbottom, O.B.E. (Fungi); Professor W. G. East, M.A. (U.S.S.R.); Professor G. B. Barbour, F.G.S.; (China); Dr. O. H. K. Spate (India, Pakistan). CHAMBERS'S contains a new Atlas in full colour prepared by Bartholomew's of Edinburgh.

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Vol CXVI Nos 4—6 *October—December 1950*

DESERT BORDERLANDS OF OMAN

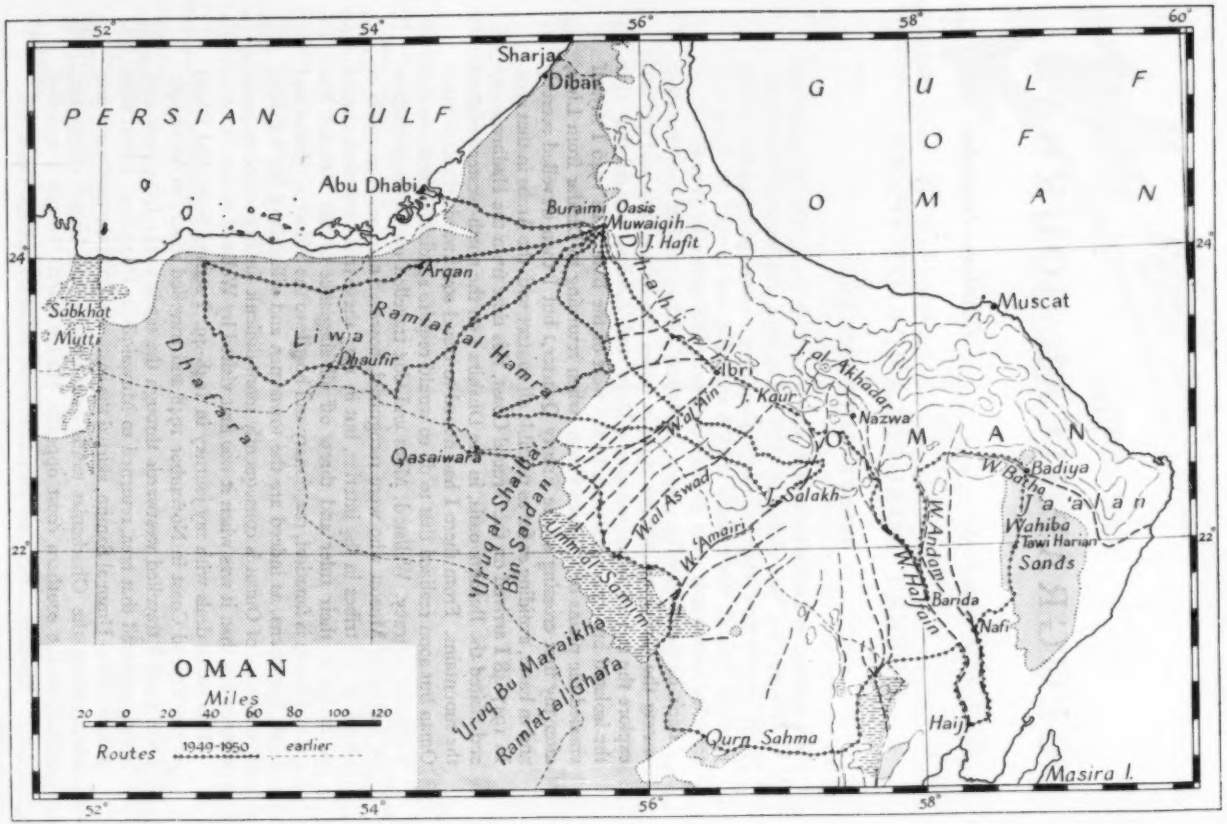
WILFRED THESIGER

OMAN HAS REMAINED the least known of the Arab lands. The interior of the country was first visited by Wellsted in 1835, and he was followed two years later by the French botanist Aucher Eloy. Colonel Miles made two long journeys through this country in 1876 and 1885, and in 1901 Sir Percy Cox travelled southwards from Buraimi to Nazwa and thence to Muscat.

Each of these travellers made important discoveries but they travelled among the towns and villages close in under the mountains,[1] and did not explore the steppes inhabited by the Duru' and Wahiba,[2] nor did they visit the isolated but extensive sands to the west of the Batha. In 1946 I myself crossed the plains of Western Oman, when returning to Dhufar from Liwa, after my first crossing of the Empty Quarter,[3] but I then travelled secretly and in haste, avoiding as far as possible all contact with the Arabs in that area. In 1947–48 I arrived on the Trucial Coast, this time from the Hadhramaut,[4] and visited the Buraimi oasis, in the Dhahira [5] on the north-western edge of the mountains. From there I had hoped to travel southwards through inner Oman but soon realized that to do so would require special preparations and a separate journey. Wellsted, Miles and Cox travelled under the protection of Sultans of Muscat who were recognized, however nominally, as rulers of Oman by the tribes in the interior, but in 1913 these tribes rebelled, elected an Imam as their ruler and threw off all allegiance to the Sultan.[6] The present Imam is fanatical, reactionary and hostile to the Sultan of Muscat and to all Europeans, as indeed are the townsmen and villagers of his domains. The interior of Oman is consequently more difficult for Europeans to penetrate to-day than it was when it was first visited by Wellsted.[7]

This paper deals with my journey in 1948–49. I started from Abu Dhabi on the Trucial Coast in November 1948 and travelled inland to Muwaiqih. From there I travelled westwards through the sands to the Liwa oasis and, having explored that area, returned to Muwaiqih in December. I then went southwards to Umm al Samim, skirted the eastern edge of the quicksand and, after visiting the Gharbaniat sands and crossing the Huqaf depression, arrived on the southern coast opposite Masira island. Thence I travelled

[1] The notes to this paper are printed at the end of the text, pp. 162–8.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24°
22°

through the Wahiba country to the valley of the Batha Badiya, under the eastern Hajar, and returned again to Muwaiqih along the edge of the Oman mountains. This journey and the journeys I had made in 1945–46, 1946–47 and 1947–48 have provided the Society's draughtsmen with sufficient material to map, in fair detail, the mountains, plains and watercourses along the southern coast of Arabia from the Sa'ar country to the Batha Badiya; the desert borderlands of Oman between the mountains and the sands; the eastern and also the western sands of the Empty Quarter itself; and the hinterland of the Trucial Coast. By far the greater part of this area had previously been filled in only from hearsay information. My subsequent journey in 1949–50 enabled me to fill the one important gap which remained; in the Duru' country along the eastern side of the Hamra Duru'.

Arrival at Muwaiqih, November 1948

I decided that Muwaiqih was the best starting place for a journey into Oman, since I had already made friends with the Al Bu Falah sheikhs, who control the surrounding villages, and who alone of the sheikhs on the Trucial Coast have some influence with the tribes farther inland. I also hoped to find there some of the Rashid who had been my companions in the past, and in whom I had complete confidence.

I arrived on the Trucial Coast in October 1948 and there I found Musallim bin al Kamam, a sheikh of the Rashid, who had travelled with me on my two journeys from Dhufar to the Hadhramaut.[8] I had hoped to have him with me the year before on my journey from the Hadhramaut across the Empty Quarter for he was a companion of great charm and exceptional intelligence and possessed of considerable authority among the desert tribes; but he had then been in the Jauf, negotiating a truce between the Dahm and the Rashid. There he had been detained by Hussain Saif al Islam, son of the Imam Yahyah, and the Governor of Jauf, in order to prevent him from joining me and guiding me into Yaman territory. After his release Musallim travelled slowly across to the Trucial Coast, where he arrived at Dibai in October, shortly before my return there from England. He joined me on my arrival and together we visited Abu Dhabi, where we were delayed by a torrential thunderstorm, which flooded a large part of the island and rendered the salt flats impassable to camels,[9] but we left on November 1 and arrived at Muwaiqih, in the Buraimi oasis,[10] four days later. The rain [11] had formed extensive lakes on the flats among the dunes and promised bountiful grazing in the months to come.

At Muwaiqih I was made welcome by Zayid bin Sultan, the youngest of the Al Bu Falah sheikhs, and a man who commands great respect among the Badu, with whom he is universally popular. I also found waiting for me Salim bin Kabina, Salim bin Ghaubaisha and 'Amair, three Rashid lads who had accompanied me on my last journey. They appeared to have spent the summer profitably engaged in harrying the Bani Kitab, a tribe with whom the Rashid have a blood feud, and serving as soldiers of fortune with the local sheikhs. Their adventures illustrate the chronic insecurity of these parts. Everywhere in Northern Oman jealous and often hostile sheikhs rely upon the uncertain support of the Badu to maintain their position. They compete

with each other for the support of the tribesmen by the lavishness of their hospitality and the scale of their gifts. None of these sheikhs are prepared to acknowledge a paramount power, nor is any of them able to enforce his authority over the Badu; indeed, none of them would venture to try lest by doing so he should alienate their support in time of need. In consequence the country is filled with outlaws [12] who fear no punishment other than the blood feud and the retaliation of hostile tribesmen. Knowing that each sheikh would rather have their friendship than incur their enmity these outlaws travel quite openly among the villages which they have robbed, assured of a hospitality commensurate with the strength and nearness of their own tribe and the reputation which they personally have acquired. Should an exasperated ruler detain them they can count on an immediate demand for their release by some other sheikh who, anxious to court their favour, would claim that they were under his protection. At present the politics of this area are dominated by the bitter enmity between the Al Bu Falah of Abu Dhabi and the Bin Maktum of Dibai,[13] the two most powerful sheikhs on the Trucial Coast. A truce in 1947 put a stop to several years of intermittent fighting but in no way lessened their hostility. Beneath recent hatreds and jealousies lies the age-old feud between the tribes of Yaman and of Nizar origin, largely identified to-day with the factions of Hanawi and Ghafari (see Appendix). The feud has torn Oman for centuries and in the Dhahira has always prevented the establishment of an effective government. Recently Saiyid Sa'id, Sultan of Muscat, pressed his claims to overlordship in the Buraimi area but the sheikhs and tribesmen concerned clamorously rejected them. Well aware that these claims were occasioned by the growing search for oil, these tribes, who are of the Ghafari faction, determined to prevent all further exploration of their territories by Europeans.

Exploration of Liwa, November and December 1948

I decided to explore the Liwa oasis before travelling southwards into Oman. I had passed through Liwa the year before, during my journey from the Hadhramaut to the Trucial Coast, and I had hoped on that occasion to explore the settlements in detail, since they had never been visited by a European, but lack of grazing and the exhausted condition of our camels had made this impossible. I now planned to travel throughout the length of these settlements which are inhabited by Bani Yas and by Manasir, who acknowledge the Abu Falah as their overlords. I left Muwaiqih on November 14 accompanied by Musallim, bin Kabina, bin Ghaubaisha, 'Amair and another Rashdi, Sahail bin Tahi, who was notorious as a raider, having in the course of a long life lifted camels from every tribe in Oman. We crossed the alternating dune chains and salt flats of Al Khatam, dotted with many wells and groves of *ghaf* trees,[14] and entered the Hamra sands, where a noisy band of 'Awamir attempted to hold us up by firing over our heads and shouting that no Christian should pass through their land. We feared that the Bani Kitab might follow us up as my Rashid had inflicted some casualties on them during their last raid, but by tribal custom my companions were free of 'Awamir territory and we knew that this tribe would be unwilling to incur a blood feud with the Rashid who were allies and descended from a common ancestor.[15]

The north-eastern sands of the Empty Quarter

A settlement at Liwa

Sand vegetation after heavy rain

When it was clear to them that we intended to go on despite their threats, they gave way and invited us to their tents, offering to feast us on a camel, but exasperated by their behaviour I refused to turn aside.

The 'Awamir came originally from the Hadhramaut where a portion of the tribe still inhabits the Quff oases and the mountains and steppes between the wadis Makhia and Qinab. From there they spread eastwards as far as Oman and established a number of villages under Jabal al Akhadar, which the tribe still holds.[16] Some years ago the 'Awamir were the dominant power in the south-eastern sands. However as security improved in the North with the extension of Ibn Sa'ud's influence over the powerful Murra tribe, many of them moved up into Dhafara, and the Bait Kathir and Bait Imani took over their grazing grounds round Mughshin. To-day there is little intercourse between the northern 'Awamir and those still living near the Hadhramaut. About fifty years ago the Musaifa and Mudairaba sections of the Rashid, pressed by incursions of the Sa'ar and the border tribes of the Yaman, left their homelands round Sanau, on the southern steppes, to their Bait Imani kinsmen, and moved gradually north into the sands. At first they dwelt among the fertile and well watered Dakaka downs,[17] but having accustomed themselves to life in the sands they penetrated ever farther and farther into the Empty Quarter, and many of them, as conditions became more settled in the north, joined the 'Awamir in Dhafara; Dakaka has however remained the stronghold of the Rashid. Most of them have now acknowledged the sovereignty of Ibn Sa'ud, but they remain the most nomadic and far ranging of all the desert tribes, and frequently cross the central sands from Dhafara to the southern steppes. Several families of the Manahil have recently drifted across the sands from their tribal lands north-east of the Hadhramaut and in the past few years some of the Bait Kathir have also appeared with their camel herds on the Trucial Coast. Always there seems to have been this outward movement of the tribes from the Yaman and the Hadhramaut, a movement which carried the Qahtan tribes into Oman perhaps as early as the ninth century B.C. In 'The seven pillars of wisdom' Lawrence describes the flow of tribes from the Yaman into Syria and says "so we see clans, born in the highlands of the Yaman, thrust by stronger clans into the desert, where, unwillingly, they have become nomad to keep themselves alive. We see them wandering, every year moving a little farther north or a little farther east as chance has sent them down one or other of the well roads of the wilderness, till finally this pressure drives them from the desert again into the sown, with the like unwillingness of their first shrinking experiment in nomad life." [18]

We rode slowly across the rolling, red downs of Ramlat al Hamra where numerous wells of sweet water made our marching easy. Nine months before we had crossed this desert, driving our camels through a drought-stricken wilderness, but in February heavy and widespread rain had carpeted the sands with succulent yellow-flowering *Tribulus*, with heliotrope and other desert plants, so that camels from among the Arab herds nearby were now dying from over-eating. Recent showers had called forth a myriad tenuous seedlings and the face of the sand was scarred and pitted with tiny marks, where small rodents had dug them out to eat the seeds from which they

sprang. Everywhere were tracks of hares and often my keen-eyed companions pulled them out from their shallow burrows where they had taken refuge from tawny eagles questing the downs. Once we drove an eagle from a fox which it had seized.[19]

While we were watering at Fuwahiq one of my party detected four raiders passing nearby with eleven looted camels. We gave chase, for we feared that they were Bani Kitab with camels taken from the Rashid herds in Dhafara, but they had seen us and were travelling fast with a long start. Musallim, bin Tahi and I followed their tracks while the others rode east to cut them off. My party overtook the raiders five hours later after an exciting chase. They were of the Manahil, and their leader was Juma'an bin Duailan, a notorious outlaw and brother of Makhbaut bin Duailan, nicknamed the "Cat," who had been killed the year before near Najran, leading a big raid on the Yam.[20] They had raided the Manasir in Liwa two days before, but, as the Manahil were at peace with the Rashid, we did not oppose them. Next day we reached the small palm grove of Bu Awana, at the eastern end of Liwa. Bin Kabina parted with us here, to nurse his camel which had been sick for some days, but he promised to rejoin us later at Muwaiqih.

We now travelled slowly westwards, through the settlements and palm groves of Liwa. East of Sabkha village the groves belong to the Manasir, but they were unattended and uninhabited. In January these Manasir had lost fifty-two killed at the hands of a Dibai raiding party and the families who had previously lived in these settlements were either dead or too frightened to remain there, while the nomads of the tribe grazed their herds farther afield. The palm groves and settlements of the Bani Yas to the west of Sabkha are considerably larger than those of the Manasir and are inhabited throughout the year. Neither the Bani Yas nor the Manasir[21] range far afield, because their camels feed on *harm* (*Zygophyllum album*) and *shanan* (*Suaeda* sp.), which grow abundantly on the salt flats in Liwa and the Batin, and afford them a permanent pasturage, little affected by drought.[22] These salt bushes make the camels very thirsty, by scouring them continuously, and this necessitates their being watered three and even four times a day. The Bani Yas and Manasir are consequently tied to the neighbourhood of their wells, whereas the 'Awamir, the Rashid, the Manahil and, farther to the west, the Murra graze their herds on desert pasturage which springs up after rain. On such grazing, camels can last for months without drinking and in quest of it these Badu will range for hundreds of miles across the desert, relying on the milk of their herds for their own needs. In times of drought they fall back on to the belts of *hadh* (*Cornulaca monacantha*).

We reached Arada, the most westerly of all the Liwa palm groves, on November 29. From here we travelled northwards to Bainuna, watering at Suaitiya on the way. This well, like all the wells in Dhafara, is very brackish and deep whereas the water in Liwa is everywhere sweet and the wells shallow. We then returned, through the Taff[23] and the Khatam sands, to Muwaiqih where we arrived on December 14 having covered 500 miles since we had left there on November 14.

The mounted falconer

Peregrine and hare

Peregrines on their blocks

Arab falconry

I spent the next month hawking with Zayid in the Khatam sands. The Al Bu Falah and Bin Maktum sheikhs of the Trucial Coast look forward eagerly to the hawking season which in these parts starts in November and usually ends in March. Zayid uses peregrines (*shahin*, pl. *shuahin*) mostly of the Eastern race, though I noticed one Barbary falcon among his birds, in preference to saker falcons (*hurr* pl. *harar*) which are preferred on the open plains of the Najd. The saker has better eyesight than the peregrine and can see a bustard on bare ground at an incredible distance, but among the sands, where bustards are easily tracked and where they can be approached from behind the dunes, the Arabs fancy the peregrine since it is swifter, bolder and more persevering than the saker. These peregrines are caught on the islands and salt flats along the Trucial Coast while on migration in November and December. Two Arabs visit a place where they have seen a peregrine, carrying with them a live pigeon as bait. After tying a length of string to one of the pigeon's legs and fastening the other end to a stone, they throw the pigeon up into the air until it has attracted the falcon's attention. They then leave it and return only when the falcon has killed it. The stone to which the pigeon is attached prevents the falcon from flying off with its kill. The two Arabs then dig a shallow pit down wind of the dead pigeon and some little distance away. One of them gets into this hole and his companion covers him over with salt bushes which grow everywhere along this coast, and then walks away. When the falcon has returned to its kill the concealed Arab pulls on the string and draws the pigeon slowly towards him and, as soon as the falcon is within reach, catches it by the leg. This they say is easy to do since the falcon always faces up wind and anyway is busy tearing at its prey. Having captured a peregrine an Arab seals its eyes by passing a thread through one of its lower lids and over its head to the lower lid on the other side. He unseals its eyes and hoods it only when it has started to feed. The Arab who is going to fly it now carries it about everywhere with him, and even sleeps with it on a block beside his head. He strokes its breast and head while he constantly hoods it and unhoods it and whenever he feeds it he shouts at it to teach it a name, such as wolf, lion or eagle. It takes him about fifteen to twenty days to train it to the lure. These Arabs fly their falcons at MacQueen's bustards [24] (*hubara*), stone curlews (*kairwan*) and hares. They do not use them to hunt gazelle. I have been told that wild peregrines will not take hares or rabbits, yet Arabs often find it easier to enter a peregrine to a hare than to a bustard. The peregrine usually follows the course of the hare, flying low and binding to it when it catches it. Hunting parties are followed by two or three saluki dogs which course any hares that are put up, and I have never seen a hare escape when hunted by both a falcon and salukis. Bustards are however the main quarry and Zayid told me that a large hunting party had killed as many as fifty in one day. A good peregrine will take seven or eight bustards in a day. The falcon, which is not taught to wait on, is loosed as soon as it sees a bustard. It seldom kills in the air since the bustard nearly always lands when overtaken and fights it out on the ground, striking with its wings and squirting its excrement at the falcon. I have several times seen a bustard outfly a peregrine but I have never seen

one worst a peregrine on the ground though this sometimes happens. These battles are however very exhausting for the falcon, and the Arabs encourage their salukis to follow a falcon as soon as it is loosed. The dogs then either force the bustard back into the air or help to kill it on the ground. Whenever I have seen a peregrine kill a bustard in the air, it has bound to its quarry.[25]

Preparations for the journey into Oman

While I was hawking, Musallim and bin Tahi bought camels for our journey into Oman. They chose Badu camels, innured to hunger and thirst and to incessant marching, rather than Batina camels which the sheikhs favour, for though this breed is famed throughout Arabia for speed and comfort they are less hardy and are capricious over food and water; [26] in any case Batina camels cost up to 1000 rupees whereas we only paid 200 for ours. They also chose animals used to travelling on gravel plains and over mountain passes, for stony ground will lame within a day [27] camels accustomed only to the sands. Bin Kabina had arrived to rejoin me. Bin Ghaubaisha and 'Amair however were little inclined for further travelling, wishing instead to remain behind and tend the camels which they had acquired. I therefore parted with them and engaged instead two 'Awamir, Muhammad bin al Jabari and Mahalhal bin 'Ati.

We tried to keep our objective secret, but everybody was prying and speculating about my real purpose. Plenty of people busied themselves with intrigue to thwart me; some because fanatically they hated me as a Christian, others because I had refused to take them with me or, not a few, because they were blood enemies of my companions. Rashid, son of Said bin Maktum, Sheikh of Dibai, hating all the Al Bu Falah and bitterly jealous of Zayid's repute among the tribes, saw here an opportunity such as appealed to his narrow nature, of humiliating his rival by hurting his guest. Suspecting that I intended to visit Oman, he sent messengers to the Al Bu Shams, the Duru', and even to the Imam of Oman, warning them that I intended to travel in their lands and attributing many motives to my journey, all evil. In consequence the sheikh of the Al Bu Shams [28] sent Zaid a message forbidding me to enter any of the Ghafari country, and we heard that the Duru' were also resolved to prevent my passage. One of the Rashid, Bakhit al Dihaimi, claimed the right to be of our party, but I had always disliked him and refused his importunities. Thwarted in his hopes of gain he vowed that none of his tribe should accompany me and, when my companions ignored his noisy threats, he turned vindictive and promised to settle with us in the sands. We pretended indifference, declaring that we were returning to the Hadhramaut across the central sands. However Zayid secretly sent off one of his retainers, a Mahri named Hamad, to find Salim bin Habarut, a sheikh of the Junuba, and to persuade him to meet us at Qusaiwara. We hoped that bin Habarut would have sufficient influence to frank us through the Duru' country to Izz, where lived Yasir, sheikh of the Junuba, and a friend of Zayid's.

The Umm al Samim quicksands

Accompanied by Musallim, bin Kabina, bin Tahi and the two 'Awamir, I left Muwaiqih on 28 January 1949, taking with me two spare camels to carry

reserves of food, and water where it was necessary. We lived on the simple fare of the Badu, dates, flour and a little sun-dried camel meat. I was of course dressed like my companions, in a loin-cloth covered with a long Arab shirt, girded with dagger and cartridge belt, and like them went barefooted in order to be as inconspicuous as possible. We travelled westwards, to avoid the Al Bu Shams who were encamped along the eastern edge of the sands, before turning south to Qusaiwara. We arrived at this well on February 6 and found Hamad and bin Habarut waiting for us. The water here is brackish but drinkable and lies only a few feet below the surface. To the south of Qusaiwara and of Umm al Zamul are the mountainous dunes of Ramlat bin Saidan and 'Uruq al Shaiba', and in that direction there is no drinkable water nearer than Ghanim. Hamad and bin Habarut were confident that the Duru' would not impede us and we therefore decided to visit the Wadi al 'Ain, to water there and then to travel down the eastern side of the Umm al Samim quicksands to the mouth of the 'Amairi.

Von Wrede was the first to record the existence of quicksands in the south Arabian desert. He claimed that in 1843 he had found a dangerous quicksand known to the Arabs as the Bahr al Safi, in the south-western sands, to the north of the Hadhramaut, and he described in 'Reise in Hadramaut' how "with the greatest caution I approached the border to examine the sand which I found an impalpable powder and I threw the plumb line as far as possible. It sank immediately the velocity diminishing and in five minutes the end of the cord had disappeared in the all devouring tomb." Bertram Thomas[29] during his journeys in southern Arabia heard of a quicksand, called Umm al Samim, on the edge of the Oman steppes; but this was 750 miles to the east of Von Wrede's estimated position for Bahr al Safi and, after making careful inquiries from his guides, he doubted whether there were any quicksands in the western sands. In 1948 I confirmed the existence of Umm al Samim, approximately where Bertram Thomas had supposed it to be, and I spoke to Arabs who had actually visited it. On that occasion I passed first to the east and then to the west of this quicksand but was unable to visit it. The following year I crossed the western sands, where Von Wrede claimed he had found Bahr al Safi, and I satisfied myself that no quicksand exists there. It is evident from his description that the sand must have been dry. Deposits of powdery gypsum and salt are indeed common in certain areas of the Empty Quarter and, owing to their softness, are wearisome to cross. It is impossible however to believe that a human being could sink in a material with a specific gravity of about 2·4, since the loose packing of the grains near the surface must give way to a close packed arrangement a foot or two below the surface owing to the weight of the material above. It is possible that under certain circumstances the evaporation of a salt marsh might leave a crystal mesh structure, supporting a hard crust into which it would be possible to disappear,[30] but I am convinced, as a result of my journey across the western sands, that no salt marshes or wet quicksands exist or have existed there. The water-table lies deep under the sands and nowhere did I see or hear of the vegetation which in these parts is always to be found on salt flats. Many of the Sa'ar, Karab, Manahil, 'Awamir and Rashid, whom I questioned, were familiar with the name Bahr al Safi; a few of them associated it with Umm al

Samim, while others thought of it as a legendary and far distant place somewhere in the northern sands. None of them connected it with the area visited by Von Wrede, an area with which many of them were familiar for they have often crossed it when raiding. I had therefore come to the conclusion that the legendary Bahr al Safi could only be identified with Umm al Samim. I was now anxious to visit Umm al Samim itself, establish its position and extent, and then to travel eastwards and explore the wadis Halfain and Andam and the Wahiba sands.

We arrived in the Badishan, the northern branch of the wadi al 'Ain, on February 10. It was bitterly cold [31] and blowing a northerly gale which whipped away the sand on the dune slopes from around the roots of the *zahra* (*Tribulus* sp.) and *qassis* (*Cyperus* sp.), so that the plants withered and died. Next day we camped in the Muwaithil, the southern branch of the 'Ain, at Al Khiran, where there was a scanty supply of sweet water at the depth of a foot. Here a number of Duru' families and a few Afar [32] were grazing their herds. Several of our camels were staling blood, as a result of the intense cold, and we feared that we should lose them if we pushed on and camped upon the open plains before the wind dropped.

The next afternoon we saw a party of mounted Arabs approaching, each camel carrying two riders, and we realized that we were in for trouble. They were Mahamid sheikhs [33] and they insisted that we must return the way that we had come, for they would allow no Christian to pass through their territory.[34] They were followed by many other Duru', as news of my presence had spread around the countryside, but not all were unfriendly and one old man and his family championed us vigorously. I had stayed with him for a few days two years before, and he now argued that I had done him no harm then, but rather good, for I had given him a present when we parted. He, and some of his friends, offered to take me on despite the continued refusal of the Mahamid, but I was unwilling to agree to this since it would have caused serious dissension in the tribe. During my wanderings among the Badu, I have never yet caused trouble among them, and my good repute was an asset for future journeys which I was unwilling to hazard. By tribal custom we were free to pass, since my companions were at peace with the Duru' and had found a Duru' who was ready to accompany us. I had no intention of paying for the right of passage, a mistake I had not yet made in Arabia. Throughout that day and the next the discussion dragged on. Each new arrival was given an opportunity, and more than one opportunity, of expressing his views, which he did, even if they had already been expressed a dozen times before by other people, and even young boys were allowed a hearing for as long as they chose to speak. Then, quite suddenly, the sheikhs drew apart, whispered together for a while, and came back and said that we could go on, provided that we passed along the edge of the Umm al Samim quicksands, thus skirting their territory. They little realized that this had been our object from the start.

We filled all our water-skins, since I was anxious to explore the Gharbaniat sands before we reached the Huqaf and we were uncertain whether we should meet with further obstruction when we tried to water in the 'Amairi. Then, accompanied by a charming old Duru' to act as our guide, we travelled across

a featureless gravel plain, strewn with limestone fragments and bare of vegetation, until we came to the shallow watercourse of the Zuaqti, defined by a sprinkling of herbs parched by many years of drought. Far away to the north-west, a line of high dunes distorted by a mirage marked the mouth of the Muwaithil.[35] Ahead of us a tawny waste stretched out to blend at an indeterminable distance with a dust-laden sky and nothing, neither stick nor stone, broke its dull monotony. This was the quicksand of Umm al Samim.[36] It extends south-east from the mouth of the Muwaithil for 90 miles, an enormous sump into which the southern branch of the 'Ain, the Aswad and the 'Amairi pour their occasional floods after heavy rain in the Oman mountains. Here it was bordered by a belt of impalpable white gypsum powder, covered with a sand-sprinkled crust, through which protruded occasional twigs of drought-stricken *arad* (*Salsola cyclophylla*). These sporadic bushes marked firm land, but farther out only a slight darkening of the surface indicated the bog below. The Badu are very much afraid of these quicksands and frequently recount how a large Manasir raiding party was engulfed in them and destroyed. One Duru' told me how he had seen a flock of goats disappear, after struggling for a while with their fleeces spread out around them, and they all said that there is no warning of danger until the surface breaks up beneath you. Large parts of Umm al Samim are unquestionably dangerous after floods or heavy rain, but no one can say which parts if any are dangerous after prolonged drought. The Duru' know of certain paths, which they follow when they go down to the Mamlahat to dig salt, and they will sometimes cross its southern extremity after a long spell of dry weather, but otherwise even they give the whole area a wide berth. I am myself convinced that it is the only dangerous quicksand in southern Arabia. Camels can be lost after rain on many of the salt flats, such as Sabkhat Mutti, or those along the shore of the Trucial Coast, for they are unable to move if they sink in a couple of feet and then they die of starvation ; but I believe that it is only in Umm al Samim that they could be engulfed.

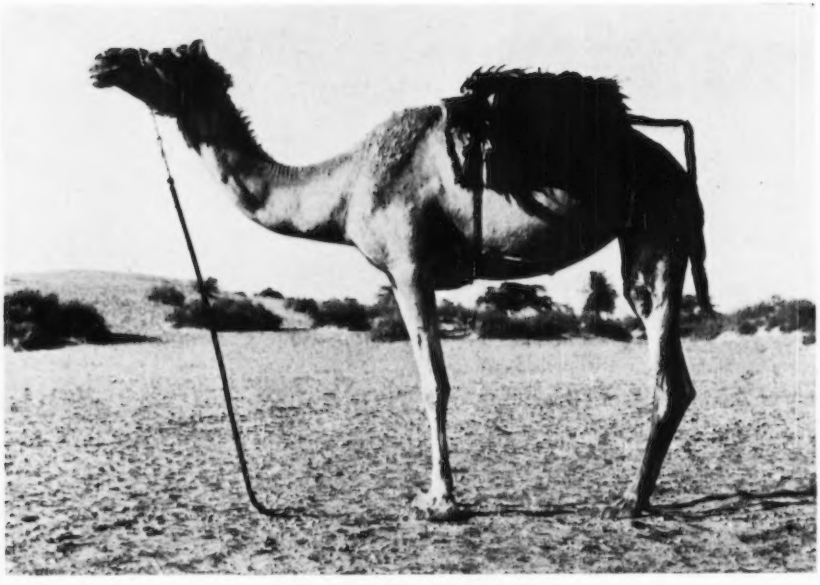
From the Zuaqti we travelled to the 'Amairi, which we reached at Raqa well on February 16. We had followed the edge of Umm al Samim as closely as possible, but beyond the Aswad it is enclosed to the north-east by stony ridges and low gypsum cliffs.[37] These are intersected by short watercourses, up which inlets of the salt flats intrude, and these inlets involved us in constant detours. Near the mouth of the Aswad many tracks converge leading to the Mamlahat, where the Duru' venture out on to the flats to dig salt, which they sell at Ibri, whereas they trade the salt from Qarat al Milh in Nazwa and the markets of Inner Oman. Muhammad Tina, who until last year was head sheikh of the Duru', was camped in the 'Amairi near Raqa. He had recently returned from an unsuccessful oryx hunt in the Gharbaniat sands, but he had seen oryx and this afforded me a reasonable excuse for visiting these sands, whose eastern limits I was anxious to define. The two 'Awamir, who were with me, and my own Rashid were happy to go anywhere, but Hamad the Mahri, and bin Habarut, accustomed to easy village life, were little inclined to travel unnecessarily in these waterless wastes. Ali, our Duru' guide, offered to lead us across the southern end of Umm al Samim and here again there was much argument, since my companions, one and all,

dreaded the idea of venturing upon this ill-omened bog and agreed to do so only with reluctance. We watered at Raqa where some fine tamarisks grow round the well; we then followed the wadi, which was 3 miles broad and well wooded with *ghaf*, until we came to the edge of the salt flats where we camped. Next morning we travelled for four hours across the dreary wastes of Umm al Samim, sinking at each step through the salt crust into the damp sand below. We were relieved when at length we climbed on to the 30-foot-high limestone ridge of Tauf Dham, which here bounds the salt flats but farther to the west projects far out into them. Then, for another three and a half hours, we rode across a gravel plain broken up by low gypsum terraces, until at last we came to the edge of the Harub sands and halted in a small grove of *ghaf* trees. To the west of us the mountainous red sands of Ramlat al Ghafa rose confusedly from snow-white flats of powdered gypsum, while to the north of them the great dune ranges of Bu Maraikha and 'Uruq al Shaiba', the highest of all the sands in the Empty Quarter, towered 500–700 feet above the flat emptiness of Umm al Samim. Looking at them, bin Kabina and I remembered vividly how two years before we had struggled for sixteen days through these waterless sands.

We travelled slowly through the Gharbaniat sands, where rose-red dunes and snow-white flats made an effective contrast. Here we hoped to find oryx, but were disappointed since little rain had fallen in this area for many years. We then crossed a stretch of the Jiddat al Zauliya and arrived at Qurn Sahma. This hill is three quarters of a mile long and consists of a dozen peaks about 150 feet high. It is largely composed of white gypsum, overlaid with a layer of black limestone fragments, and is cut into by numerous gulleys. Qurn Sahma is a landmark [38] from afar, since it rises from a gravel expanse which falls away on all sides for about two miles to the encircling white sands. We camped near this hill, among the *ghaf* trees of Hailat al Ghabara, where shoots of *qassis*, *rimram*, and *qurn* had sprung up after a recent shower, and here for the first time we came upon fresh oryx spoor. Unfortunately our water was nearly finished and we were forced to push on across the Sih Lahaimar, instead of lingering here to hunt. Our guide was several times misled by small sand dunes which had formed on this otherwise featureless gravel plain since he had passed this way two years before. Two days later we arrived at the low broken cliffs of the Huqaf, which extend north and south for about 130 miles, and enclose along their western edges the depression in which lies the Sabkhat Suaidat. These cliffs, although capped with an 8-foot layer of coarse conglomerate, consist of a thick bed of white kaolin, on top of a grey limestone. We watered at Muqaibara well, one of the several wells which are to be found in the series of cliffs along the western edge of the Huqaf, but the water in the Huqaf is everywhere so brackish that it is almost undrinkable even by Badu standards. In January 1947 I had followed the eastern edge of the Huqaf from Haushi to Bai, so I now travelled northward along the edge of the cliffs, which bound the Sabkhat Suaidat to the west, and crossed in turn the various small wadis which drain into that depression. The wadi Ghaba now ends in a separate salt flat, to the west of the Sabkhat Suaidat, but it seems certain that in the past it flowed into the main depression, along what is known as the wadi Bu Rumaitha. This

The sheihk of the Yahahif, Wahiba

A young Wahiba girl



A thoroughbred Batina camel

Farai well, Wahiba country

considerable watercourse is choked with sand drifts, which in part overlie thick deposits of silt, but originally it must have carried heavy floods, which can only have come down the Ghaba. The Jilfa, Turban and Haushi enter the Sabkhat Suaidat along its northern edge.

The Wahiba country

We were now on the edge of the great plain of the Adaba, which stretches from the wadi 'Amairi to the wadi Halfain, and is shut in to the north by Jabal Salakh. To the east of us was the land of the Wahiba,[39] the dominant and most numerous of the Badu tribes in Southern Oman. They range eastwards from the wadi Halfain as far as the Batha, beneath the eastern Hajar, and northwards to the edge of the cultivated country; the Al Hiya division lives mostly on the plains to the east of the wadi Andam and in the Wahiba sands, the Yahahif division along the wadis Halfain and Andam. They use small black goats' hair tents, but when living in the wadis often build themselves shelters from tree trunks and branches. The Wahiba are entirely nomadic only their head sheikh, Sultan bin Mansur, and his family spending part of the year in the village of Aflaj, under Jabal Madar. Unlike the Rashid, the 'Awamir and the Murra, they are not far ranging but remain generally within the limits of their "dira." They own large herds of camels and their prized strains of Banat Farha, Liskia and Al Buaidha are famous throughout southern Arabia. They also possess large flocks of sheep and goats, and many donkeys.[40] Dates,[41] which they buy in the neighbouring towns and villages, are a staple part of their diet. The Wahiba are famed for their hospitality and I certainly found them to be a delightful people.

Bin Kabina and I had met an ancient sheikh of the Yahahif at Haushi in 1947 and as we had just slaughtered a camel, we had been able to entertain him nobly. We had heard from some 'Awamir, in the Huqaf, that this sheikh was encamped near Farai' well and we sent him a message telling him of our arrival. He joined us next day at the well, where Wahiba, Harasis, 'Awamir, Junuba, Afar and a few Bait al Lihaifi were watering, and welcomed us warmly. He assured us that we were free to go where we would in Wahiba territory and offered to accompany us himself; but as he was old and frail we persuaded him to send his cousin Hamad bin Sa'id with us in his stead. Hamad had only recently arrived back from Riyadh, where he had gone with a large party of Wahiba to sell camels and to pay his respects to Ibn Sa'ud. Unfortunately his party had suffered severely from fever and eleven of them had died on the return journey. The funeral feasts had lasted many days and had only just ended. When one of the Wahiba dies his relations slaughter a large part of his herds for the funeral meats. A similar custom is observed by the Qarra in the Dhufar mountains, but my Rashid, who knew the Qarra well, told me that these Wahiba feasts were even more lavish than those of the Qarra.[42]

While we were watering at Farai', a Wahiba lad recognized bin Kabina's camel as one which had been raided from him the year before. By tribal custom he had no claim to it since bin Kabina had bought it fairly. He was however pathetically anxious to recover it, for Badu become very much attached to their camels, and he finally took it in part settlement for

another camel, a magnificent animal which bin Kabina was impatient to acquire.

We reached the wadi Halfain, at the Uruk well, on March 5 and followed it south past the *ghaf* woods of Madira to Haij. Near Haij we sought out a secluded side valley, hidden behind low hills, and that evening slaughtered a camel which we had recently bought for meat.[43] A very strong southerly gale got up early next morning and lasted for two days, driving clouds of sand before it. This was infuriating, for we had anticipated this feast hungrily for days and it was now impossible to cook or eat among the whirling eddies of sand, but luckily the strips of meat, hung up to dry among the thorn trees, were above the worst of the driven sand. We had hoped that no Arabs would find us here, as the country was drought stricken and appeared to be deserted, but four turned up the first evening and eight more by the following morning. They were Hikman who dwell in the Bar al Hikman on the coast opposite Masira Island, and, like the Fizara, are now dependants of the Wahiba who however scorn to intermarry with either of these tribes.

This southern coast is mostly occupied by the Junuba,[44] who also lay claim to the wadi Halfain. These Junuba were, until recently, a very powerful Badu tribe and they controlled the desert from Halfain westward as far as Mughshin, but their power has waned in the desert and to-day, though still very numerous, they are chiefly settled along the coast from Jazir to Sur. Most of the nomadic Junuba now live in the wadis north of Jabal Salakh. The eastern Junuba appear to recognize the sheikh of the Bani Bu Ali as their overlord or "tamima," while the western Junuba recognize Yasir bin Hamid who lives at Izz. Traditionally they are enemies of the Wahiba, but actually the two tribes live together amicably in the Halfain. The Junuba are allied to the Duruʿ who are also of the Ghafari faction, whereas the Wahiba and the small neighbouring tribe of the Harasis [45] are Hanawi.

We watered next day at Haij; [46] the water here is the sweetest in either the Halfain or the Andam, where most of the wells are slightly brackish. The Halfain enters the sea opposite Mahut which can be seen on a clear day from this well, as can Masira island, but driving sand and dust limited our view to less than 100 yards. We camped 7 miles to the east of Haij where the Andam spreads out and ends in a wide tree-filled basin surrounded by low sands. The wind dropped during the night and next morning we followed the wadi northwards. It would have been park-like and pleasant here had the many *ghaf* trees been in leaf, but the country was very dessicated. The land of the Wahiba was indeed suffering from several years of drought and pasturage was very scanty. *Tarfa* tamarisks [47] and various kinds of salt bushes grow on silt deposits in the lower reaches of the Halfain and Andam, where I also noticed many bushes of dark coloured *assal* (*Suaeda monoica*). I had found it growing profusedly on the Hijaz coast near Qunfidha, and Musallim told me that it was plentiful in the Daham country of the Eastern Yaman, but in these parts I had previously only seen a few bushes near Khaur Wir. In the Andam we passed several packages of dates, stowed in the branches of trees against the day that some nomad family should return this way, a tribute to the honesty of the hungry Badu. Gazelle abounded here, but those we saw were very shy, and our attempts to shoot one were unsuccessful.

We reached Nafi well, where some Al Hiya were watering their camels, on March 11.

A visit to Batha Badiya, 11 to 21 March 1949

I was anxious to cross the Wahiba sands and Hamad persuaded one of these Wahiba, named Sultan, to come with us as our guide. I arranged to meet the rest of my party ten days later at Barida, in the Halfain, where there was said to be a little grazing for their hungry camels and, accompanied by bin Kabina, Hamad and Sultan, I left the wadi and travelled eastwards across a gravel and limestone plain, smothered in places under drifts of red sand. The following afternoon we reached the wadi Mirair which is marked by *ghaf* and *rak* (*Salvadora persica*) bushes, but is only nominally a wadi since it has no bed and never flows. Here I found fragments of ostrich eggs, but the bird itself has been extinct in these parts for some fifty years. Sultan told me that two years before an oryx had been seen here; it was evidently a wanderer from the steppes to the west of the Huqaf, the nearest place where they are now found; *damani* (*Gazella saudia*) are however common, though *rim* (*Gazella marica*)[48] are unknown. Beyond the Mirair are the Wahiba sands whose highest dunes lay to the east of us. We now turned northwards, since the axis of these dunes is north and south, whereas throughout the greater part of the Empty Quarter it is approximately east and west. We rode at first across the rolling downs and then along valleys half a mile wide which were enclosed by dunes of a uniform height of about 200 feet and whose steep faces were on the eastern sides of the valleys. Though the axis of the overlying dunes lay north and south, the intervening valleys were blocked at intervals of about two miles by gradual rises of hard sand which seemed to indicate that there had been a change in the prevailing winds and a consequent reorientation of the dunes. The valley floors and hard downs near the Mirair were the colour of dried blood, while the softer sands were honey coloured, both becoming paler as we travelled farther north. Nowhere did we see any prominent sand features, but from the dune tops we looked over an expanse of sand waves and small crescent hollows which were dotted with *abal* bushes, especially near the northern edge of the sands.[49] We found some Hiya Wahiba watering at Tawi Harian, a well 85 feet deep where the water is rather brackish. To the east of Tawi Harian are the wells of Tawi 'Aqda, said to be 140 feet deep, Tawi Shauqab, Ghadir Falful and Tawi Markha. The two small Badu tribes of Al Bu 'Aisa and Al 'Amr, both of them Hanawi, share these sands with the Wahiba.

We reached the far side of the sands on the evening of March 15, four days after leaving Nafi, and camped among the dunes overlooking the villages of Batha Bidiya,[50] with their cultivated fields and palm groves. Beyond the valley rises the great rampart of the eastern Hajar, barren, precipitous and forbidding, while farther east are visible the peaks of Jabal Ja'alan near the mouth of the Batha.

We were now entering territory which is effectively administered by the Imam, Muhammad bin Abdullah, who is recognized as ruler of inner Oman by all the settled tribes, both Ghafari and Hanawi, between Ibri and the Bani Bu Hasan villages in Ja'alan, and by the Badu tribes of Duru', the

western Junuba, the Wahiba and Harasis. He has, temporarily at least, composed the feud between the Ghafaris and the Hanawis and his representatives are to be found in every group of villages where they administer justice and collect taxes. The Imam's hold over the Badu is, of course, weak and he does not tax them; Ibn Sa'ud is indeed the only ruler in these parts of Arabia who collects *ziqa'* from the nomad tribes. The Badu do however recognize the Imam as their overlord and the expression "God lengthen the life of the Imam" is frequently heard amongst them and sincerely meant, since by affording them a tribunal and by composing their differences he has brought to them security and justice. Here a man can walk unarmed and leave his camels unattended without fear that he will be robbed. We, accustomed to the chronic insecurity of the Dhahira, had kept our rifles always within reach, until the Wahiba laughingly told us that we were now in a land of peace. The Imam is however hostile to Christians, a sentiment which is shared by the settled tribes in these parts, who like all villagers are more fanatical than the Badu. The company of Hamad and Sultan ensured my safety among even the wildest members of their own tribe, but they maintained that my identity as a Christian and a European must remain unguessed if we were to pass through the villages of the Hajriin, the Harth and the Habus. They were confident that our short cut through the sands had placed us well ahead of the news, and they assured me that none of the Arabs here would expect to meet with a European and that I could therefore pass myself off as a Baluch or as a townsman from some distant part of Arabia. Badu are all-observing; every action and every word is noticed and remembered. To try to pass among them as a tribesman would be to invite exposure at the first glance, but their world is limited to the desert and its fringes. The Duru' in the wadi al'Ain had told us that they had often speculated about me when I had stayed with them two years before but that it had never occured to them that I was a European.[51]

Next morning we rode past the villages and palm groves of Batha Bidiya. The valley is about six miles broad and is shut in along the west by the sands which have engulfed the Hajriin village of Raqa. There had been no rain here for some years and the soil was cracked and bare, but there was evidence of a more serious water shortage than could have been caused by a few rainless years. Several villages, such as Hathu and Qa', had been completely abandoned and others, such as Qabil, had been largely deserted, while I noticed that most of the palms at Wasil were dead. This had been caused by the drying up of the *aflaj* (sing. *falaj*), the underground water channels which supply the villages and cultivations.[52] The valley of the Batha is followed by the caravans which carry dates from Nazwa to the coast and we passed many such caravans of camels tied head to tail. We stopped and exchanged our news with each party of Arabs in turn. My companions told them that we were from Sur and were travelling to the Batina, but I remained discreetly silent, except for the customary salutations, though always conscious of the silent scrutiny of their dark eyes. We skirted the Harth villages which lie to the north of the main Batha watercourse,[53] and then followed the valley, inhabited above Tawi Silaim by the Qanamba Badu, to its head in the broken red hills of the Haimha and then descended the wadi Ithli to the

Habus villages. On the banks of the Ithli I noticed a few trilith monuments,[54] similar to those which I had seen in Dhufar. These, and a few which I had seen in the Andam, were the only ones I saw during my journey,[55] though I was told by the Badu that there were some near the Mamlahat at the mouth of the Aswad. Such monuments are especially common on the northern side of the Dhufar mountains and are always associated with tumuli. I had seen a few triliths as far west as the Sa'ar country, but none on the north side of the sands, though tumuli are common there especially on the cliffs round Jabrin. We were now short of food and anxious to buy lucerne for our hungry camels, so Sultan and bin Kabina visited the market at Mudhaibi,[56] while Hamad and I waited for them outside the village.

During the past days the visibility had been poor owing to haze,[57] but now we could see the tremendous bare wall of Jabal al Akhadar which rises to 10,000 feet [58] and extends for 50 miles from the Sumail gap to the wadi Bani Ghafir; 70 miles to the north of us we could distinguish the great massif of Jabal Kaur. Near by were the jagged peaks of Saufrat al Khashabi and Saufrat al Duh and behind them were the high limestone domes of Madhamar and Salakh; to the south, Madar rose abruptly from the gravel plain. We camped that night in the Andam. There were several villages near by [59] and small gardens and scattered palms along the wadi, irrigated from shallow rivulets bordered with oleander.[60] The Andam is here enclosed between high banks of conglomerate, and of red shale with inclined joints 3 or 4 inches apart. These banks became lower as we rode south, but at Al Quaira the watercourse had cut through a cliff of white kaolin, capped with a band of dark conglomerate, leaving a sheer-sided island, perhaps 25 feet high, in the middle of the wadi bed.

The return through Oman to Muwaiqih

We rejoined our companions at Barida, in the wadi Halfain, on March 21, ten days after parting from them at Nafi; they were grazing their camels near the encampment of Ali bin Sa'id, a sheikh of the Yahahif. He feasted us next day at his tent which was only a few yards long and pitched like a windbreak under a tree. His wives, with whom as is here customary we had shaken hands on arrival, joined us later, while we were drinking coffee, and took part in the conversation. Among these southern Badu, and as far west as the Sa'ar and Karab, women will sometimes drink coffee with men, but of course never eat with them. They are treated with considerable respect and Badu will always rise to greet them. A few days before we left Muwaiqih a Mansuri had shot his sister for immorality; this would have caused little comment among the tribes of northern Arabia but my companions loudly expressed their disapproval, saying that it was a monstrous thing to have done. Among the desert tribes, from the borders of the Yaman to the mountains of Oman, an unmarried girl or divorced woman is allowed much freedom [61] and few, if any, of them are virgins when they marry; bastards are common and are not disparaged since these Badu say that the fault is the fault of the mother and not of the child. Among the Humum they are especially numerous and are said to form almost a clan of their own. Before we left his tent, Ali's wives produced a small dish filled with a yellow oil made

from *hal* (sesame), *zafran* (saffron) and *waris*, mixed with a little amber. We dipped our fingers into this and then rubbed it over our faces and beards. I have not met with this custom except among the Wahiba and the Duru', but the Mahra and some of the Kathir tribes anoint the faces and bodies of young men with such oil before their circumcision.

Sheikh Ali warned us that the Ghafari tribes to the north had news that a Christian was among the Wahiba and were determined that he should not enter their territory. We should however need to travel through their country for a week or more if we were to return to Buraimi and, though it is often possible to slip through unfriendly country provided that the tribes have not been warned, these Arabs knew our present whereabouts and our destination. I had with me however a letter from Zayid to Yasir bin Hamud head sheikh of the western Junuba, who lived at Izz, asking him to help me. Yasir had been royally entertained by Sayid at Buraimi the year before, on his way to Riyadh, and had then promised Zayid that he could call on him for anything. Yasir is one of the greatest of the Ghafari sheikhs. We believed that he could get us back to Buraimi if he was so minded and now decided to seek his help. We travelled north up the Halfain and passed within a few miles of the town of Adam, built under the small limestone dome of Hinaidila in the gap between the mountains of Madhamar and Salakh. It is inhabited by the Mahariq who had recently been at war with the Junuba, and by some of the Al Bu Sa'id, the tribe from whom the present ruler of Muscat is descended. To avoid passing through the town we travelled round the eastern end of Madhamar which is probably about 1500 feet high; Salakh is about 3000. The two mountains run westward for 30 miles, in the shape of a great crescent from the Halfain to the 'Amairi. They rise abruptly from the gravel plain and their rounded silhouettes are visible from afar. The limestone of which they are formed has been weathered to leave no prominent features and nowhere is vegetation apparent on the naked rock.

I now sent Hamad, Zayid's Mahri retainer, to Yasir with Zayid's letter, and two days later Yasir and his son met us at Tawi Yasir. Hamad told me that Yasir was much embarassed by my arrival; the Imam had heard of my presence in these parts and had ordered the tribes to hold me up, but that Yasir had felt obliged to receive me since I carried a letter from Zayid. Next day he sent me to the Wadi Khawan, at the back of Izz, while he himself rode up to Nazwa to see the Imam. He came back in the evening, accompanied by two of the Imam's representatives and carrying a letter from the Imam authorizing the tribes to let me pass. I heard that Yasir had that morning met a party of horsemen sent by the Imam to intercept us and had induced them to return with him to Nazwa. After much argument he had persuaded the Imam to allow him to accompany us to Buraimi. He had also sent to Mamur, a Duru' settlement nearby, and induced Huwashil, one of the Mahamid sheikhs, to join us. I soon realized that it would have been quite impossible to slip undetected through the country between here and Buraimi, now that the tribes were on the watch for us, and that without Yasir and the Imam's representative we should have met with serious difficulties.

We rode across a stony plain between broken hills.. To the north-east rises the wall of Jabal al Akhadar whose stark barren precipices belie the

Musallim bin al Kamam

Salim bin Kabina

name of the "green mountain"; from it jut out the rocky buttresses of Fai and Firq which interpose between the Halfain and its two main tributaries, the Yahalah and the Wadi Nazwa, while to the north a lofty three-peaked spur links Jabal Kaur with Jabal al Akhadar. Prominent among the foothills are the dark peaks of Fahul Taimasa, the light-coloured mass of Khamaila and the jagged hills of Hailat Sausa and Fahulat al Jizwa. In the distance we could see the towns of Manah, Tanuf and Birkat al Mauz and later in the day we saw the palm groves and castles of Bahlah and Jabrin. We crossed an imperceptible watershed, which here divides the wadi systems of the Halfain and the 'Amairi, and arrived at the wadi Bahlah and later at the wadi Saifam. The Saifam runs close under the southern face of Jabal Kaur and then bends southwards along the edge of Hamra Duru'.[62] It joins the wadi Bahlah below Fil to become the 'Amairi, which then flows under Jabal Nahada and out on to the Duru' plains, through the gap between Saufrat Bu Haraima and the western end of Salakh. Jabal Kaur, probably the second highest mountain in Oman, is only divided from Jabal al Akhadar by the steep and difficult pass of Qaima, while to the west it is linked with Hamra Duru'. Inner Oman is thus separated from the Dhahira by Jabal Kaur and the broken wilderness of Hamra Duru'. The Jizwa plain, Hamra Duru' and many of the low jagged hills extending as far east as Al Haimha are composed of red and blue-grey shales, whereas Jabal Kaur consists, at any rate in part, of limestone, as do the summit of Jabal al Akhadar and certain of the higher foothills, such as Hawiya and Khamaila. Nowhere on this journey did I find any granite or basaltic rock *in situ*, although water-worn fragments of these rocks are common in all the wadis from the Batha to Buraimi.[63]

I was anxious to follow the Najd al Buaidha route, which passes directly under Jabal Kaur, but Yasir demurred, saying that a recent raid by the Bani 'Ali from Yanqal on the Duru' at Tanam had made this route unsafe. This was an absurd excuse and probably hid other reasons, for it was only with difficulty that I induced him to take this road, instead of crossing Hamra Duru' by the Najd al Tawiain. We left the wadi Saifam, a few miles below the adjacent but hostile towns of Saifam and Ghafat,[64] and skirted the western edge of Jabal Kaur. The track crosses a neck of limestone hills which connects Kaur with Hamra Duru' and forms the divide between the 'Amairi and the 'Ain, while the Aswad rises a few miles to the west beyond Najd al Tawiain. Here we met Muhammad al Riqaishi, Governor of Ibri. He had heard of my presence in the neighbourhood and was hastening over to Nazwa to see the Imam, determined to prevent me from approaching Ibri. He had just met Yasir and Huwashil who were some distance ahead of me and, having learnt from them that I was travelling in their company, had cut short his greetings. A small man, smothered under a large turban, he was bristling with unconcealed indignation when we met him. As we parted one of my companions asked him the conventional question "Is there anything I can do for you?" to which he answered, as he gave his camel an angry blow, "You would not have brought the Christian here if you wished to oblige me." Shortly afterwards my Rashid heard with glee that Bakhit al Dahaimi and bin Ghaubaisha had visited his palace a week before and, having been left without dinner, had kidnapped his butler and sent him a message that they were

Jabal Kaur from the wadi Saifam

going to sell his servant in the interior. Al Riqaishi had had to ransom his slave for 150 rupees.

We rode down the watercourse, past the conspicuous white peak of Khatmat al Buaidha, to the valley of the Qab which joins the 'Ain 3 miles below the small village of Kubara. From here there was a magnificent view of Jabal Kaur, a huge light-coloured dome scarred and seamed with narrow sheer-sided watercourses. We were told that there are several villages inhabited by the Bani Hinah on the mountain [65] and we could see some scattered trees near its summit. Next day we continued down the valley and reached Ibri at sunset; farther up the valley we could see the great castle of 'Ainain above the palm groves of Araqi.[66] We camped outside Ibri and did not enter the town since Yasir was anxious that my presence should remain unknown. Beyond Ibri we should enter the territory of the Baluch, the southern Bani Kitab and the Al Bu Shams,[67] tribes which do not acknowledge the rule of the Imam. It was impossible to forecast what action they would take if they heard of my arrival. The discovery of oil on the Trucial Coast has roused the cupidity and suspicion of the nearby tribes and has made them increasingly jealous of their rights. Involved in intrigues to increase or preserve their territorial claims, they are at present agreed only in the policy of excluding all Europeans from their land. We therefore decided to travel fast to Muwaiqih and to avoid the villages along our route. Early next morning we crossed the hills behind Ibri into the broad valley of the Jifra and riding down it we skirted the Baluch village of Mazam and the Aflaj Bani Kitab.[68] For two days we rode beneath the wall of the mountains, which was occasionally broken by grim gorges through which watercourses flowed out on to the plain; the wadi Bu Karba, in which lie the settlements and palm groves of Dhank, Dut, Fida and Yanqul, was the largest. On April 5 we arrived at Qabil, at the southern end of Jabal Hafit and early next morning we rode into Muwaiqih. We had ridden 1100 miles since we had started out from Zayid's fort on January 28.

Journey through the Duru' country in 1950

I returned to the Trucial Coast from England in November 1949 and from there I travelled inland to Muwaiqih where I found Salim bin Kabina, Salim bin Ghaubaisha, Sahail bin Tahi and Muhammad bin Kalut waiting for me at Zaiyid's fort. My object was to travel through the Duru' country to the cities of inner Oman and from there into Jabal al Akhadar, but bin Kabina warned me that the Duru', from whose country he had just returned, had told him that they would kill "the Christian" if he again entered their territory. It was obvious that I could no longer pass undetected amongst them. In any case it would only be worth while revisiting their country if I could travel slowly and go wherever I wished, and I could only hope to do this if I were under the protection of one of their powerful Mahamid sheikhs. I therefore asked Zayid to send a messenger to Ali bin Hilal, the head sheikh of the Duru', inviting him to come to Muwaiqih. I spent the time while we were waiting for a reply hawking with Zayid in the Khatam sands. At the end of December Huwaishil, one of the most influential of the Mahamid, who had travelled with me from Oman to Muwaiqih the year before, arrived

at our hunting-camp with a small party of Duru' and agreed, after much discussion, to take me through the Duru' country to Oman.

I left Muwaiqih on January 12 accompanied by Huwaishil, three other Duru', a Janaibi, my four Rashid, a Kathiri boy and one of the 'Awamir who had been with me the year before, Muhamad bin al Jabari. I thus had with me tribesmen from both the Ghafari and Hanawi factions. The Duru' have a bad reputation for treachery and the other Badu maintain that they frequently murder their travelling companions and then say they have died of snake bite. I knew however that I could depend upon my Rashid and 'Awamir companions to be on the look out for trouble, since they were on bad terms with the Duru' whom they had recently raided. We travelled southwards along the fringe of the sands through Al Bu Shams territory; these Al Bu Shams live to the west of the Hajar on the gravel plain and on the edge of the sands between Jabal Hafit and Safah. Their sheikhs had recently declared that no Christian might enter their country and they had been angry when they heard that I had passed through it the year before. We hoped however to avoid their encampment; to have avoided their country altogether would have involved us in a long detour through difficult sands and some of our camels were in poor condition. Three of the Al Bu Shams whom we encountered near their southern boundary attempted to hold us up but we did not heed them. We were held up again a few days later near the wadi Samhan by the Muqairida, a powerful section of the Duru', who have been for some years at variance with the Mahamid and inclined to dispute their authority. They were led by Sulaiman bin Kharas who had detained us the year before in the wadi al 'Ain and who, although himself of the Mahamid, is bitterly jealous of Ali bin Hilal and Huwaishil. After two days of angry argument Huwaishil declared that we were going on whether the Muqairida liked it or not. But the Rashid assured me that if we did it would certainly lead to fighting, for the Muqairida were determined to stop us, having publicly vowed that they would divorce their wives if they allowed the Christian to pass. I therefore suggested to Huwaishil that he should go on ahead to Ali bin Hilal whose encampment was in the wadi al Aswad, and persuade him to come and join us; I said that I would wait where I was until he returned. This appeared to satisfy the Muqairida though they warned us that even if Ali turned up they would still not allow us to go through their country. They asserted that the Mahamid had no authority over them and that in any case Ali was only a Badu sheikh and unable to act against the wishes of his fellow tribesmen. They admitted that I was well spoken of by the tribes, but argued that they were Badu who cherished their own way of life and were afraid that if they allowed one Christian to pass he would be followed by others in motor cars, looking for oil, who would seize their land. As soon as Huwaishil had ridden off they dispersed to their encampments and we were left for a while in peace. A spell of unusually clear weather was now followed by a gale from the south which turned overnight into an even stronger gale from the north with some rain in the nearby mountains. It blew hard for four days and the driving sand and piercing wind caused us much discomfort for we were camped in the open without shelter. The Muqairida now collected around us once more and declared that we must

leave their country since Huwaishil had not returned. I knew that Huwaishil, supposing that we were all right, would not travel in this bitter weather, and for three days we argued unavailingly. The Muqairida increased in number daily, which made the Rashid apprehensive for they felt that they would not assemble in such numbers, or camp in the open in such weather without food or shelter, unless they anticipated loot. They warned me to beware for they had heard the Duru' say that it would be less trouble to kill the Christian than to go on the pilgrimage to Mecca. Finally, five days after Huwaishil's departure, the elders of the Muqairida required us to leave by the following afternoon and that evening an Afari, who as a Hanawi sided with my Rashid, came and warned us that they planned to invite our three Duru' companions to a further discussion and then to seize and disarm them before attacking us. We therefore decided to travel slowly westwards into the sands hoping that Huwaishil would overtake us. The Muqairida followed us as far as Awaiya well and occupied it as soon as we had watered there. The nearest water which we were now free to use was in the Rabadh 70 miles to the west.

Huwaishil joined us on February 5, two days after we had arrived in the Rabadh, and told us that he had met Ali bin Hilal who was well disposed towards me; they had travelled together to the wadi Samhan and when they parted they had arranged to meet again in the wadi al 'Ain. Huwaishil said that from the Rabadh we could skirt the Muqairida territory and that anyway it was unlikely that we should meet with any Arabs on our way as the intervening country was drought-stricken. We were delayed a further two days in the Rabadh by another bitter northerly gale with showers of rain, but arrived in the wadi al 'Ain on February 12 and met Ali at the Bu Sini well. He was friendly and helpful and accompanied us as far as the Aswad. An Arab boy who was with him was sick; evidently with influenza for within a few days nine of us were ill, with violent headaches, pains all over our bodies, and high temperatures lasting for two or three days; we later heard that there had been an epidemic round Ibri and several deaths. Lack of water forced us to go on, though for the two or three days that the sickness lasted it was difficult to remain in the saddle. The fever was followed by a rending cough which lasted for about three weeks.

We arrived in the 'Amairi, at the southern end of the limestone hills of Saufrat Bu Haraima, and followed the wadi past Salakh and Nahada to the gap between the Hamra Duru' and Hammat Bu Khisa where we stopped near the village of Habi on February 22. This is one of four small villages surrounded by palm grooves which owe allegiance to Huwaishil. We were now on the edge of the Junuba country and Huwaishil left us to go to Tanuf and ask Sulaiman bin Hamyiar if I might visit him. Sulaiman is the sheikh of the Bani Riyam who inhabit Jabal al Akhadar, and is the accepted head of all the Ghafari tribes in Oman. Huwaishil returned from Tanuf on February 26 and told me that Sulaiman had invited me to come to Birkhat al Mauz, but he added that the hue and cry was now out after me and that the Imam had given orders that I was to be stopped at all cost from visiting Sulaiman. On their way to Tanuf, Huwaishil and his party had halted for a meal in Bahlah but on the way back the inhabitants had shut their doors against them. He warned me that a pursuit party sent by the Imam was

close behind him and advised us to cross the valley and camp in the hills above Mamur where we should definitely be in Duru' country. He had sent one of Sulaiman's men back to tell him what had happened and to say that we would remain for two days at Mamur. We therefore rode across the valley and camped at the edge of the hills; here we were joined by some Junuba who had been with me the year before and by some Wahiba who invited me to revisit their country. These tribesmen were a welcome reinforcement to our numbers and their presence gave us the backing of two powerful tribes.

Next morning our camel guards reported more than a hundred armed townsmen concealed in a nearby watercourse and a little later four of them came into our camp. Their leader, one of the Imam's household slaves, told us to leave immediately and said that the Imam had ordered them to kill me if I attempted to travel any farther into his territory. Huwaishil answered that we intended to remain where we were until we heard from Sulaiman. They protested strongly and were later overheard by one of the Junuba arguing as to which of them should shoot me and claim the reward. We therefore refused to allow any of them to come near us and the situation, which was becoming uncomfortably tense, was only eased when a messenger came from Sulaiman to say that he was on his way. He arrived in the afternoon and camped in Mamur village, a cluster of palm frond cabins and two or three mud buildings grouped round a small mosque, where I found him sitting in a courtyard crowded with his retainers and those of the Imam. He is a striking figure and impressed me as a powerful if not very congenial personality. He is without the narrow fanaticism of most Omani townsmen, interested in the inventions of the west and prepared to make use of them, and this, and his obvious ambition, makes him suspect with the Imam. He was angry that the Imam had prevented me from coming to Birkat al Mauz at his invitation and by meeting me at Mamur he had defied the Imam and asserted his independence, but he was now obviously unwilling to take me to Jabal al Akhadar and thereby risk a more serious quarrel. Although disappointed at the failure of my plans, I was glad to have met him, for he is, except for the Imam, the dominant figure in Oman.[69] His arrival had ensured our safety for we could now count ourselves under his protection and he promised to remain at Mamur until we had withdrawn into the shelter of the Duru' hills. It was pleasant to return at sunset to the friendly and warm-hearted society of my companions after sitting for hours among these fanatical villagers, the focus of so much hostility and aversion.

We travelled slowly along the western edge of the Hamra Duru' until we came to Ali bin Hilal's encampment in the Aswad; he offered to accompany me to Muwaiqih, an offer which I gladly accepted, and told me that the Al Bu Shams were determined to stop me from going through their country again and that the Muqairada had promised to give them warning of my approach. Both he and Huwaishil advised me to avoid their territory by travelling westwards through the sands. Duru' are always reluctant to enter the sands, whose bitter water they find intolerable, and I realized that they must have good reason for such an unwonted suggestion. I had however neither the time nor the inclination for this detour and suggested instead that we should try to approach the Al Bu Shams boundary unseen and then

cross their country in one night; to this they agreed. We therefore climbed over the low sandstone escarpment of Gharif Aswad and after crossing the dark shingle beds of the Hammat Rafash arrived in the wadi Al 'Ain where we watered at Sulaiman well. Thence, avoiding all Arab encampments, we travelled to the wadi Samhan where we rested our camels for a day. On March 9 we lingered until sunset in the Shaib al Musallah and then, alternately trotting and walking our camels, rode northwards through the night past Sanaina towards Jabal Hafit and at 4 o'clock the next morning unsaddled at Kharais well just west of Qabil. The following afternoon we rode into Muwaiqih. I travelled with bin Kabina and bin Ghaubaisha to Dubai where we spent a happy week with Edward Henderson and Ronald Codrai of Petroleum Concessions Limited.

For five years Salim bin Kabina had been my constant companion in southern Arabia and together we had ridden many thousand miles since he had first joined me in the wadi Khawat. Twice he had crossed the Empty Quarter with me, enduring the inevitable hardships of hunger and thirst and the strain of constant watchfulness. He and Salim bin Ghaubaisha had known full well what must have been our fate had we chanced on Arabs while we crossed the western sands in 1948, when the tribes were everywhere at war. At Sulayil they had been imprisoned and while we were among the fanatical Dawasir and again among the villagers of Oman they had incurred for my sake the odium of travelling with a Christian. In moments of danger and through months of toil I had marvelled at their courage and endurance, their kindness and their gaiety. Despite barriers of race, creed and upbringing they had bound me to them by powerful ties of friendship and I grieved to part from them. I know that for me the constant fascination of their barren land springs in great part from the comradeship of these desert people.

Note :—Owing to difficulties in production, the folding map to accompany Mr. Thesiger's paper will be issued with the next number of the *Journal*, which is to contain a note by Brigadier R. A. Bagnold, F.R.S., on the sand dunes shown on the map.—*Ed. G.J.*

APPENDIX

Ghafari and Hanawi [70]

Throughout Oman and as far west as Dhufar all Arabs, whether nomads, cultivators or townsmen, are divided into the two rival factions of Ghafari and Hanawi, and even newcomers to Oman such as the Baluch have to identify themselves with one of these two parties. This cleavage dates back to the dawn of Arab history, although the terms Ghafari and Hanawi are only about 200 years old.

Arabs divide their race into the 'Arab al 'Ariba, the descendants of Qahtan or Joktan and the 'Arab al Must'Ariba, descended from Adnan the offspring of Ishmael. Qahtan tribes from the Yaman invaded Oman as early as the ninth century B.C. The largest of these immigrations probably occurred after the Azdites were overtaken by disaster in their homelands round Marib. The predecessors of the 'Arab al Must'Ariba on the other hand pushed northwards from south-western Arabia long before the time of Abraham. They were pro-

foundly modified by contact with the non-semitic peoples of the north, and some of them, the 'Arab al Must'Ariba, were eventually thrust back into the Arabian peninsula. In the fourth and fifth centuries A.D. some of these same Adnan tribes moved south to escape from Persian attacks, and threatened the supremacy of the Yaman or Qahtan tribes in Oman. Much bitter fighting ensued. In the latter half of the ninth century the Yaman tribes identified themselves with the Ibadhi sect of Islam, while the Adnan, or Nizar as they were often called, upheld the orthodox Sunni doctrines. Thus to their previous dissensions was added the bitterness of religious intolerance. The Nizar, worsted in the field, called in the help of the Khalif of Baghdad, who sent Muhammad bin Nur to their assistance at the head of a large army. Muhammad ravaged the country from end to end and the havoc and cruelties which his forces inflicted on the Omanis have never been forgotten or forgiven. This was probably the most calamitous period in the troubled history of Oman.

The two factions have ever been at feud or at war with one another, and the tribesmen often use the names, instead of Adnani or Qahtani, to denote their supposed origin. Imam Saif bin Sultan, the greatest of the Ya'ariba princes, died in 1711 and was succeeded by his eldest son Sultan bin Saif, who in turn was succeeded as Imam in 1719 by his son Saif bin Sultan, a boy of twelve. Muhanna, a great uncle of the young Imam, was appointed Regent but, not content with this position, proclaimed himself Imam; Saif managed to escape. Muhanna soon became unpopular and one of his nephews, Ya'ariba bin Bal'arab, rebelled and captured and executed him. Ya'ariba then reinstated Saif bin Sultan and declared himself Regent, but proclaimed himselt Imam in 1722 with the support of the powerful Bani Riyam tribe. Bal'arab bin Nasir, a brother-in-law of Sultan bin Saif, rebelled against him at the head of the Bani Hina tribe, compelled his surrender and, for the third time, reinstated Saif bin Sultan, with himself as Regent. He was soon faced by a formidable rebellion led by Muhammad bin Nasir, sheikh of the Bani Ghafar. The greater part of the Nizar tribes sided with Muhammad and the Bani Ghafar, while most of the Yaman tribes allied themselves with Bal'arab and his Bani Hina supporters. The names Ghafari and Hinawi were used to distinguish the two sides. Bal'arab was captured by Muhammad bin Nasir but his place was soon taken by another able leader, Khalf bin Mubarak al Hanawi, known as "the dwarf." Muhammad was elected Imam in 1724 but bitter fighting continued until 1728, when both Muhammad and Khalf were killed in battle at Sohar. Saif bin Sultan was once more proclaimed Imam but was finally deposed in 1742. Unable to find any further support for his cause in Omam, he turned to Persia for help and his country was soon invaded by a large Persian force. The Omanis suffered many defeats but were finally rallied by Ahmad bin Sa'id, one of the small Al Bu Sa'id tribe from Adam, who at that time was Governor of Sohar. He succeeded in driving out the Persians and, after having overcome the Ya'Ariba family and their Ghafari supporters, was elected Imam and founded the present Al Bu Sa'id dynasty.

Though the term Hanawi is to-day more or less synonymous with Yamani and Ghafari with Nizari, there are however certain important exceptions. The Harth, whose sheikh is recognized by the Hanawi tribes as their leader, are descended from the Bani Tamim and are thus of Nizar origin, while the Bani Riyam, whose sheikh is the acknowledged head of the Ghafari tribes, are of Qahtan stock, as are the Junuba and Naim, both of which tribes count to-day as Ghafari. Similarly the Bani Ruwaiha and the Bani Yas now rank as Hanawi although they are of Nizar origin. The most unexpected defection is however that of the Bani Ghafar, who gave their name to the Ghafari faction, but joined

the Hanawis seventy years ago as the result of a tribal fight in which they had received no assistance from the other Ghafari tribes.

Notes on the text

[1] (*a*) Wellsted visited Sur, Bani Bu Ali, Bani Bu Hasan, Badiya, Ibri, Samad, Manah, Nazwa, Tanuf, Saiq, Jabrin, Sharaiqah, Birkat al Mauz, Nazwa, Wadi Samail, Sib; and on another journey from Suwaiq, by Wadi Hawasinah to Miskin, Maqniyat, by Wadi al Kabir to Aradh and Ibri, and then back to Suwaiq. See 'Travels in Arabia,' 1838. (*b*) Aucher-Eloy visited Matrah, Nakhl, Saiq, Tanuf, Nazwa, Jabrin, Izki, Farq, Birkat al Mauz, Wadi Samail. 'Relations de Voyages en Orient de 1830–1833,' pp. 545–578. (*c*) Miles visited Buraimi from Sohar in November 1875, and in 1876 travelled from Barkah to Nakhl, Saiq, Sharaiqah, Birkat al Mauz, Izki, Wadi Samail, Matrah. In 1885 he travelled from Matrah to Samail, Izki, Izz, Adam, Manah, Karsha, Bahlah, Jabrin, Nazwa, Tanuf, under J. Kaur to Dariz, Ibri, Dhank, Aradh, Maqniyat, Miskin, Rostak, Barkah. *Geogr. J.* 18 (1901) 465–98; 36 (1910) 159–78, 405–25. (*d*) Sir Percy Cox travelled from Buraimi to Hafit, Dhank, Ibri, Saifam, Jabrin, Bahlah, Nazwa, Tanuf, Saiq, Sharaiqah, Muti. *Geogr. J.* 66 (1925) 193–227. (*e*) See also Zwemer, *Geogr. J.* 19 (1902) 54–64, for a description of his visit to Buraimi, and G. M. Lees, *Geogr. J.* 71 (1928) 441.

[2] The author's transliteration of Arabic words in this paper and on the forthcoming map have not been reduced to the R.G.S.II system.—*Ed. G.J.*

[3] "Across the Empty Quarter," *Geogr. J.* 111 (1948) 1–21.

[4] "A further journey across the Empty Quarter," *Geogr. J.* 113 (1949) 21–46.

[5] The Dhahira is the plain, lying between the mountains of Northern Oman and the edge of the sands, from Ibri as far north as Kahl; this area includes al Jau which is the gravel plain between Sanaina and Buraimi immediately under the mountains. The *ghaf* filled valleys among the dunes north of Buraimi are known as al Widian. The Hajar is the mountain range running north from Jabal al Akhadar to the Rus al Jibal. It separates the Dhahira from the Batina. The eastern side of these mountains is called the Hajar al Batina and the western side the Hajar al Dhahira.

[6] In Oman the Ibadhi sect of Islam have always maintained that their ruler should be elected. The Al Bu Sa'id dynasty, who succeeded the Ya'ariba in 1744, established a hereditary succession, but their neglect of the elective principle has always been deeply resented. Between 1784 and 1856 the growth of Omani sea power, overseas conquests, of which Zanzibar was the most important, and especially the removal of the capital from Rustaq to Muscat weakened the hold of the Saiyids over the interior of Oman, while foreign treaties and interference added to the fanatical resentment of the tribesmen. Azzan bin Qais, an elected ruler, reasserted Al Bu Sa'id authority in the interior and recovered Buraimi from the Wahibis, but after he had been killed Turki and then Faisal only maintained themselves in Muscat with British support.

In 1913 the tribes, both Ghafari and Hanawi, rebelled and elected Salim bin Rashid al Kharusi as their Imam. The Sultan rapidly lost all control of the interior, and by 1915 the Imam was threatening Muscat. His forces however suffered a serious defeat when they attacked a British force at Bait al Falaj outside Matrah. The Imam was murdered in 1920, and the present Imam, Muhammad bin Abdullah al Khalili, was elected. In the same year a treaty was signed between the Sultan and the Omanis by which the Sultan agreed not to interfere in their internal affairs. Salim bin Rashid belonged to the Ghafari faction whereas the present Imam is a Hanawi. The Imam is elected by the Sheikh of the Bani Riyam, who is head of the Ghafari faction, and the Sheikh of the Harth, who is head of the Hanawi faction. It seems probable that the son of the late Imam will be elected when the present Imam dies.

The following is a list of rulers of the Al Bu Sa'id dynasty: 1744–83 Admad bin Sa'id. 1783–84 Imam Sa'id bin Ahmad (the last genuinely elected Imam of Oman). 1784–92 Saiyid Hamad bin Sa'id. 1792–1804 Saiyid Sultan bin Ahmad. 1804–07 Saiyid Badar bin Saif. 1807–56 Saiyid Sa'id bin Sultan. 1856–66 Saiyid Thuwaini bin Sa'id. 1866–68 Saiyid Salim bin Thuwaini. 1868–71 Saiyid Azzan bin Qais. 1871–88 Saiyid Turki bin Sa'id. 1888–1913 Saiyid Faisal bin Turki. 1913–32 Saiyid Taimur

bin Faisal. 1932 Saiyid Sa'id bin Taimur. The Arabs of Oman refer to the ruler of Muscat as the Saiyid, Europeans call him the Sultan.

7 "Wellsted therefore made his exploration of Oman under very favourable circumstances and without serious risk until he tried to enter the northern territory." Hogarth, 'The penetration of Arabia,' p. 136.

8 "A new journey in southern Arabia," *Geogr. J.* 108 (1946) 129–45.

9 To prevent a camel from slipping on a wet salt flat the Badu fasten a piece of string round each of the camel's feet so that it passes underneath the sole with a large knot just behind the two toes.

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I LEAP OVER THE

On her twenty-first birthday Monica B of the Catholic Church. Twenty-eigh rescript from Rome, she left the co monastic life were intact : but she real Miss Baldwin's years of seclusion did n for life, and the story of her return to is engrossing reading, and has given he and recommended volume of the year have forgotten to get out at my stati (**Hamish Hamilton 15s : RU 4s**)

TO OBTAIN 77- WOR

bin Faisal. 1932 Saiyid Sa'id bin Taimur. The Arabs of Oman refer to the ruler of Muscat as the Saiyid, Europeans call him the Sultan.

? "Wellsted therefore made his exploration of Oman under very favourable circum-

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a man who decided, instead of merely nd reading his book we are reminded of tage, broken, windowless, doorless, and g herbs. Here he faced poverty, wind, ighting. Collecting foxglove, agrimony, eyebright, Murray was beaten at last, ibraries a book 'in the best tradition of n of photographs, and a lingering sense : RU 4s)

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the Hanawis seventy years ago as the result of a tribal fight in which they had received no ai

Notes on the t

[1] (*a*) Wellste Manah, Nazwi Samail, Sib; a Maqniyat, by V in Arabia,' 18 Jabrin, Izki, F de 1830–1833,' and in 1876 tr Wadi Samail, Manah, Karsha Aradh, Maqni 159–78, 405–2 Saifam, Jabrin, 193–227. (*e*) S visit to Buraimi

[2] The author map have not b

[3] "Across the

[4] "A further

[5] The Dhahi edge of the sand gravel plain be *ghaf* filled valle Hajar is the mo It separates the the Hajar al Bat

[6] In Oman th be elected. The a hereditary su deeply resented conquests, of w the capital from of Oman, while of the tribesme in the interior killed Turki an support.

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bin Faisal. 1932 Saiyid Sa'id bin Taimur. The Arabs of Oman refer to the ruler of Muscat as the Saiyid, Europeans call him the Sultan.

[7] "Wellsted therefore made his exploration of Oman under very favourable circumstances and without serious risk until he tried to enter the northern territory." Hogarth, 'The penetration of Arabia,' p. 136.

[8] "A new journey in southern Arabia," *Geogr. J.* 108 (1946) 129–45.

[9] To prevent a camel from slipping on a wet salt flat the Badu fasten a piece of string round each of the camel's feet so that it passes underneath the sole with a large knot just behind the two toes.

[10] The Buraimi oasis consists of the following villages: Buraimi, Hamasa, al 'Ain, Muwaiqih, Mataradh, Jimi, Qatara, and Hilli. Buraimi village belongs to Saqr bin Sultan sheikh of the Naim, and Hamasa to the Shuamis. The other villages are ruled from Muwaiqih by Zayid bin Sultan of the Al Bu Falah, Shakhbut's representative.

[11] The following exceptionally widespread and heavy rain occurred in the southern desert 1947–49: In July and November 1947 in the western sands; February 1948, northern sands from Aflaj to Buraimi; October 1948, eastern sands from Sabkhat Mutti to Buraimi to Wadi al 'Ain and also from Mughshin to the Wadi Qinab and across the central sands from Dakaka to Dhafara; December 1948 in the north eastern sands, and in March 1949 along the eastern edge of the sands from Buraimi to the Huqaf.

[12] Notorious outlaws are Tuwairish and Muhammad bin Janazil, both Afar; Muhammad bin Sulaim, an outcast Mansuri; and Juma'an bin Duailan, a Manhali. Tuwairish leads a band of some thirty brigands from the Duru', Bani Kitab, Al Bu Shams and 'Awamir.

[13] The Al Bu Falah command considerable respect throughout south-eastern Arabia since they are all accepted as being of noble birth. In the past they were rulers of all sections of the Bani Yas, although they are of different origin from that tribe, but the Al Bu Falasa in Dibai broke away and established their independence in 1833. Abu Dhabi was founded about 1760.

The following is a list of the Al Bu Falah sheikhs: Dhiyab bin 'Aisa was murdered by Hazza bin Zayid in 1793. Hazza bin Zayid (1793–95) escaped during a revolt. Shakhbut bin Dhiyab (1795–1816) was deposed by his son Muhammad bin Shakhbut (1816–18) who in turn was expelled by his brother Tahnun bin Shakhbut (1818–33). Tahnun was murdered by his two brothers Khalifa and Sultan and was succeeded by Khalifa bin Shakhbut (1833–45) who was murdered by 'Aisa bin Khalid (1845). 'Aisa was murdered by Dhiyab bin 'Aisa, a cousin of Khalifa's. Dhiyab bin 'Aisa (1845) was murdered by Khalid, the son of 'Aisa bin Khalid, and succeeded by Sa'id bin Tahnun (1845–55). Sa'id fled and was succeeded by Zayid bin Khalifa (1855–1908) who died peacefully. He was succeeded by his son Tahnun bin Zayid (1908–12). Hamdan bin Zayid (1912–22) succeeded him on his death and was murdered by his brother Sultan bin Zayid (1922–27) who in turn was murdered by his brother Saqr bin Zayid (1927–28). Saqr was murdered by a slave at the instigation of his brother Khalifa and with the backing of the Manasir tribe. Shakhbut bin Sultan, a grandson of the famous Zayid, was then appointed sheikh.

[14] Few ghaf trees (*Prosopis spicigera*) are to be found to the west of the Khatam sands. Farther south they grow in the Gharbaniat sands but only really extend westwards as far as Mughshin. I noticed three ghaf trees in a wadi just east of Mukalla. A dwarf variety grows in the Hadhramaut (*Prosopis farcia*).

[15] Salim bin Hamad ba Rakal is the hereditary sheikh of the 'Awamir. He has placed himself and a part of his tribe, mostly of Al Badr, under Ibn Saud. They live in Dhafara and the western sands. The 'Awamir living in Northern Oman and in the Hamra sands follow Salim bin Ham and acknowledge the Al Bu Falah as their overlords. These 'Awamir are mostly of Al Liz. Both ba Rakal and bin Ham are from the Haiyu section of Al Badr. For 'Awamir sections see 'A further journey across the Empty Quarter,' p. 23, note 3.

Both 'Awamir and Al Kathir claim descent from Hamdan bin Zaid and both tribes sometimes use the battle-cry "Hamdan Ya Bin Jadi." The Kathir are divided into (*a*) Kathir al Rathama comprising the Rashid, Muharam, Al Sharaif, Bait Duais, Bait Sandal, Bait Afadir, Bait Miliha, Bait Ali bin Badr, Bait Ghuas, Bait Kaukabi,

Bait Habas. (*b*) Bait Ali bin Kathir comprising Sharia', Marahim, Shalahma (Shasha, Bait Musan) and Dahadha (B. Ghuas, B. Jidad, B. al Hamar, Masaliha). (*c*) Bait Khawar comprising Al Bahri and Bait Shahri.

[16] Barzaman and Aiyun, inhabited by the Maqadha section of the 'Awamir are near Jabal Madar, while Qila', Aqil, Shafa', Hamaidhiin and Saiyahi under the Qa'lat al 'Awamir peak are near the Sumail gap.

[17] See Bertram Thomas, 'Arabia Felix,' pp. 193 *et seq.*, and "A journey into the Rub' al Khali," *Geogr. J.* 77 (1931) 1–37, and Philby, 'The Empty Quarter,' 1933, and "Rub' al Khali," *Geogr. J.* 81 (1933) 1–26.

[18] 'The seven pillars of wisdom,' p. 37.

[19] This fox and another one collected from near Jabal Hafit were *Vulpes Vulpes Arabicus* (Thomas, 1894). In 1950 I saw a very pale coloured fox in the Rabadh sands, and I handled two almost white cubs which had been captured near Qusaiwara in the same sands. These foxes were probably *Vulpes Ruppelli Sabaea* (Pocock, 1934). Eagles not infrequently kill sheep and goats. I have seen this happen in the Wahiba country and near Muwaiqih.

[20] Badu tribes can be identified by their battle-cries. Rashid—Ba Rashud; 'Awamir—Ayal 'Amar; Manahil—Walad Manhil; Sa'ar—Bin Hatim, or Abin Sanad; Karab—Bil Aswad; Yam—Walad al Wa'il; Mahra—Bin Bahur (B. Zaibnaut), Harzai (Harawiz), Bait Bauki (Bait Kulshat section), Bin 'Amr (Bait Samada section); Duru'—Aulad 'Ali; Wahiba—Ani al Wahaibi Rai Farha; Junuba—Aulad Jabir, or Aulad al Kafira (used by Al Bu Ghalib section and refers to a Persian ancestress); Bani Yas—Aulad Zaid; Manasir—Ayal Mansur; Bani Kitab—Aulad Infari; Bani Ka'ab—Aulad Ka'bain; Naim—Aulad al Naim; Al Bu Shams—Aulad al Shamsi; Dhuahir—Aulad Dhahir; Habab—Aulad Mahbub; Harasis—Rai Kaza; Afar—Bin Mahut sim al Maut; Murra—Bin Shatala, or Bin Shabib, or the name of a tribesman's camel or sister; Qahtan—Aulad Jamb, or Dhib al Infajar Ibn Sa'ad.

When 'Awamir and Al Kathir tribesmen are raiding in company with Mahra the raiding party use Ya Dakai as their battle-cry. Ya Dakai is sometimes used by the Mahra instead of their own battle-cries.

[21] For sections see 'A further journey across the Empty Quarter,' p. 39, notes 1 and 3.

[22] Vegetation is frequently used by Badu as a means of directing someone. For instance "Continue north for 2 days until you come to the edge of the *hadh* and then . . ." or "The well is on the southern side of the big salt flat near the *shanan*."

[23] Trufles (*Terfezia Goffartii?*) grew in the Taff this year in December and January, and edible toadstools (*Podaxon*) were plentiful in the Khatam in April and May and in November and December. Tarthuth (*Cynomorium coccineum*) and basul (*Cistanche lutea*) were common in the Khatam, the Ramlat al Hamra, the Batin and Liwa. The Badu eat the *tarthuth* raw and their camels eat the *basul*. Both *tarthuth* and *basul* are also found in the Ghanim and Sahma sands.

[24] Some MacQueen's bustards remain in these parts throughout the year and breed there. The Arabs told me that they were nesting in January. Large numbers arrive on migration from Syria, Iraq and Persia in November and December.

[25] Falconry is practised by the Arabs in the Najd and Hijaz, at Kuwait and Bahrain, and on the Trucial Coast. It is not practised in Oman, Dhufar or the Hadhramaut. Peregrines on the Trucial Coast are worth from 50 to 60 rupees whereas saker falcons which are generally brought there by sea fetch up to 200 rupees. The saker finishes moulting a month earlier than the peregrine. The following words are used by the Arabs on the Trucial Coast:

Lure—*tilwah*, block—*waqar*, hood—*burqa*, glove—*manqala*, jesse—*sabuq*, leash—*mirsal* (they do not use bells), an immature falcon—*firkh*, an adult bird—*jarnas*. The lure is generally made from two bustards' wings tied together but a dead bustard or hare, or even a glove may be used. Falconers generally carry with them a live pigeon with which to try to recover a lost falcon. They purge their birds with sugar. Eagles sometimes interrupt a day's sport since a falcon will not fly if there is an eagle in the sky. Occasionally a falcon is caught unawares and killed by an eagle. I have seen a peregrine flown at a raven, which it killed.

For falconry at Kuwait see H. R. P. Dickson, 'The Arab of the Desert,' London, 1949.

[26] Famous Omani camel strains are Batiniyat: Banat wuld arja, Banat al Laiba, Banat Masaiha, Banat al Khawaira, Banat al Khaldi, Banat al Bahri. Abu Falah: Banat Saughan. Naim (Salf): Banat Dhiban. Al Bu Shams: Banat al awais. Niadat: Banat al wurud. Bil Khail: Banat al wari. Bani Ritab: Banat Dhubian. Duru': Banat Lasaifar and Banat Hamra. Wahiba: Banat Farha, Buaidha and Liskia. Junuba: Banat Samha, Banat Samiha, Banat Daraiba, Banat Dali. Afar: Banat Farha (the Wahiba captured this strain from the Afar). Manasi: Banat al khatal (Bu Mandhar), Banat al Waraid (Bu Sh'ar).

[27] A paste made from crushed qarad (*Acacia* sp.) seeds boiled in camel's urine is effective for hardening their feet.

[28] Muhammad bin Salimin ba Rahama, by origin a Mansuri, is sheikh of the Al Bu Shams. The Al Bu Shams were originally a section of the Naim but are to-day independent. They comprise the Bait Rahama, Al Nuwail, Al Qishashta, Al 'Arian, Al Awabid, Hinaidila, Al Kuamil, Al Dharufa, Al Kilabana. Associated with them are Al Aziz and Sualim whose sheikh Matar bin Salim lives in Dhank.

The Naim sections are Al Khuraiban (sheikh Saqr bin Sultan at Buraimi and Rashid bin Hamaid at Ajman), Al Awawda, Al Muzariqa, Al Falait, Al Sulf, Al Bitharat, Al Mashana, Al Niyadat, Al Khawatar, Al Musawala, Al Rumaithat, and some Bani Jabir who are their dependents.

The Shuamis (sheikh Hamad bin Kuraisha) live in the villages of Hail, Rabi and Hamasa.

Fifty years ago the Naim were a large and powerful tribe but to-day they have little importance. The Al Bu Shams are however an important factor in these parts.

[29] 'Arabia Felix,' p. 184.

[30] This possibility was suggested to me by Brigadier Bagnold. The bearing powers of quicksands as given in Hook and Kinne ('Foundations, abutments and footings') are $\frac{1}{2}$ to 1 ton per square foot. For some alluvial soils figures as low as $\frac{1}{4}$ ton per square foot are given. If we assume an average area of half a square foot as that supporting a human body of an average weight of 10 stone, the pressure exerted will not exceed 300 lb. per square foot—a figure considerably below those given for minimum bearing powers. The inference is that the materials to which these data apply will comfortably support human beings.

"Dry quicksands" are discussed by Bagnold ('The physics of blown sand and desert dunes,' pp. 237, 240). He concludes that dry quicksands, which he says are pools of soft yielding sand into which "a six-foot rod can be thrust without effort" are deposits formed by the advance of old slip-faces on pre-existing dunes. He also says that as a result of avalanching, the grains are piled anyhow with large spaces between them, and the density of the mass is relatively low. In consequence, applied pressure tends to encourage a relative movement of grains into an arrangement of closer packing and therefore smaller volume. Expulsion of air, which must accompany the shrinkage of volume, converts the mass momentarily into a semi-fluid condition. The problem of loose sand is also considered by E. M. Kinele "Dominant factors in the formation of firm and soft sand beaches," *Journ. Sed. Pet.* 6 (1936) 16, and his paper is discussed by J. M. Trevethan, *Journ. Sed. Pet.* 11 (1941) 42.

[31] The temperature at sunrise in the desert during the months of December, January and February is usually between 50° and 55° F.; I have recorded temperatures as low as 44°. The noon temperature at this time of the year is usually about 80°.

[32] The Afar belong to the Hanawi faction. They are few, the grown men in Oman numbering only about forty; but others of this tribe live round Habarut at the back of Jabal al Qamr on the southern coast. They are however important since they are accepted as *rabia* by both the Hanawi and Ghafari tribes in Oman.

[33] The Duru' are divided into (*a*) Bin Dira' comprising (i) Mahamid, and also Awlad Jabha, Al 'Adul, Awlad Anfafi, Habanin, and the Mutawha who are their dependents, (ii) Laba divided into Batun, Tu'aba and Muqairida; and (*b*) Naida comprising Awlad Afara, Shamata, Mahatit, Zuaiat, Maraikhin, and Makhada.

The Khamaiyis are dependents of the Duru'.

The head sheikh of the Duru' is Ali bin Hilal. Until two years ago Muhammad Tina, who is still alive, was head sheikh. Both Ali and Muhammad are from the Bait Matar section of the Mahamid.

[34] Most of the Duru', Junuba and Wahiba are armed with ·450 Martinis firing a lead bullet, which many of these prefer to ·303 Martinis or even to ·303 magazine Lee Enfields. The ·303 is however preferred in the Dhahira.

[35] There is no drinkable water in the Ramlat bin Saidan, the 'Uruq al Shaiba 'or the 'Uruq bu Maraikha, to the west of Umm al Samim, though salt water can be found anywhere on the flats between these dunes at a depth of a few feet. Drinkable water is found at Qusaiwara, Umm al Zamul, throughout the Ramlat al Rabadh, the Batin, Liwa and Ramlat al Hamra and (at a greater depth and more brackish) in Dhafara. This water must come from the northern branch of the 'Ain and the Bu Karba. The drinkable water in the Ghanim sands comes from the Dhufar mountains. The Sahma sands, Ramlat al Ghafa and the Gharbaniat are waterless.

[36] Some of the Rashid and the 'Awamir call this quicksand Umm al Samin while others call it Umm al Samim. The Duru' seem to call it Umm al Samim but all the southern Badu slur the last consonant in a word making identification difficult. Mr. Philby sends the following note: "Thesiger discusses the spelling of this famous quicksand. Quite correctly, in my opinion, he has adopted the spelling Umm al Samim throughout in the text of his paper. But he points out that certain tribes of the district pronounce it Umm al Samin. I discussed the matter with him some time ago, suggesting that the underlying meaning of the name must be "poisonous" and that it is derived from the root *summ* = poison."

Quite recently, in reading Bruce's 'Travels,' I came across the following passage on p. xl, vol. I, of the 1790 edition published in Edinburgh: "Ras Sem is five long days journey south from Bengazi; it has no water, except a spring very disagreeable to the taste, that appears to be impregnated with alum, and this has given it the name it bears of Ras Sem, or the Fountain of Poison, from its bitterness." Bruce's "Sem" is unquestionably identical with *samm* or *summ*.

[37] *Dhifaira* (*Cleome droserifolia*) is common here. This plant is usually associated with gypsum, and is abundant round Sanau (southern steppes) where the surface of the ground consists largely of gypsum. Among the plants which I noticed in the small wadis along the edge of Umm al Samim, between the 'Ain and the 'Amairi, were ghaf (*Prosopis spicigera*), silm (*Acacia Ehrenbergiana*), shanan (*Suaeda* sp.), 'arad (*Salsola cyclophylla*), harm (*Zygophyllum album*), kub, haqabit (*Salsola leucophylla*), harmal (*Rhazya stricta*), rimram (*Heliotropium* sp.), lawai, hasham (*Farsetia longisiliqua*), nisi, niza (*Convolvulus microphyllus*) and la'.

[38] In 1945 I visited Ras Sahma from Mughshin. While I was there I misunderstood my guide and concluded that Qurn Sahma was an inconspicuous outcrop of rock among the nearby sands.

[39] The Wahiba are divided into Al Hiya (comprising Bin Ghufaila, Al 'Amr, Al Hindi, Madabala, Al Muharib, Al Asakira, Al Muthamina, Jidala, Mushaqara, Muramha, Mubasa, Al Khamis, Munis, Qanamba), Yahahif (comprising Awlad Hamad, Sua'd, Umghaira, Khababiz, Shualil, Thubub, Tahamis, Qarahna, Budur), Al Musalim and Taba'. The Hikman, Fizara and some nomad Baluch are to-day dependants of the Wahiba.

The Yahahif often refer to Al Hiya as the Wahiba. The head sheikh of the Wahiba is Sultan bin Mansur of the bin Ghufaila. Said bin Rashid of the Awlad Hamad is sheikh of the Yahahif.

[40] In the Hajriin, Harth and Habus villages I saw horses and cows but none among the Wahiba.

[41] The best varieties of Omani dates are Fardh, Khalas, Khanaizi, Bu Ma'an, Birshi, Mabsali, Naqhal.

[42] See 'Arabia Felix,' p. 55.

[43] The Badu extract the fat from the bones, etc., as follows: Break up all leg bones, ribs, backbone, etc., then clean the stomach and put the bones inside the stomach and tie up the opening. Light a big fire in a pit and as soon as it has died down scrape out the embers. Place the stomach in the pit and erect a thick stick upright beside the stomach, and fasten the cord, which ties up the opening of the stomach, to the tip of the stick, to keep the opening on top. Now bury it with hot sand and embers, but keep the embers from contact with the stomach. Light a large fire on top of the piled sand. Leave for thirty-six hours, by which time all the marrow and fat will have run out of

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the bones. Open the stomach and bale out the liquid. The meat on the bones is good to eat. Allow the fat to congeal and pour off the blood and liquid. Boil the fat with spices and salt and store in containers, preferably of lizard skin.

[44] The Junuba are divided into Al Muhammad (comprising Majala, Fuaris, Al Bu Hamaid, Al Ghazail, Mushahma, Al Bu Ghalib, Juama', Al Jaria), Al Sa'ad (comprising Shuarib, Thuabit, Sualim, Kizazba, Mudhakir, Hababsha, Ma'bka, Harafish, Al Dubaiyan, Mukhana, Mushabqa) and Ghaialin. Yesir bin Hamid is head sheikh of the western Junuba, though Said bin Sultan is sheikh at Mahut and Khamis bin Hilal at Masira Island. All three are from the Majala.

[45] Sections of the Harasis are Bait Aksit, Bait Mutaira, Bait Sha'Ia, Beit Qadhran, Bait Afari and Bait Barhauh. Their head sheikh is Sharqi bin Akas of the Bait Aksit. They speak a Semitic language of their own, as do the Mahra, Qarra, Shahra, and Bautahara. They have a curious custom of milking their goats on to hot stones placed in the milk bowl, and these stones can be seen wherever they have camped.

[46] Bertram Thomas visited Haij during his journey along the coast from Ja'alan to Dhufar in 1927. "South-eastern borderlands of Rub' al Khali," *Geogr. J.* 73 (1929) 193.

[47] *Tarfa* indicates a high salt content in the ground.

[48] A few *rim* are to be found in the Duru' country on the gravel plains among the dunes of Kharimat al Aslab near the end of the wadi Samhan.

[49] Qishrib (*Euphorbia* sp.), which I had previously only seen on sands in the Huqaf, is plentiful here. Qassis, zahra, ailqi (*Dipterygium glaucum*), barkan (*Limeum indicum*), rimram, fani (*Arnebia hispidissima*), alaidh, maluh (*Vogelia indica*), hailama (*Lithospermum callosum*), dhaidah, hatitah, la'lat (*Polycarpaea repens*) and niza grow here after rain, while harm grows in some of the valley bottoms and rak (*Serra incana*) and marakh (*Periploca aphylla*) grow in the Wadi Mirair. Occasional ghaf trees occur throughout the sands.

[50] Wellsted travelled up the wadi Batha; the wadi is divided into two districts. Batha Badiya consists of the Hajriin villages of Wasil, Shahik, Mintirib, Falai Matawa, Yahath, Ghabi and Hawia (There is a daily market in the afternoon at Mintirib where the Imam's representative lives), the Harth villages of Qabil, Dariz, Mudhairib, Ibra, Izz and Dhabir (The afternoon market is at Mudhairib). There are also the Mualik villages of Masrun and Barhalain and the Masakara villages of Alaia, Yahamdi and Nasib. All these tribes are of the Hanawi faction. The second district, Ja'alan, consists of the villages of the Bani Bu Hassan, the Bani Bu Ali, the Bani Rasib, the Khasham and the Junuba. Of these tribes the Bani Bu Hasan are Hanawis and the rest are Ghafaris. In 1820 the British sent an expedition against the Bani Bu Ali, which was however defeated with the loss of six officers, 270 men and all its guns. The following year the tribe was subdued by a force under General Sir Lionel Smith, and suffered very heavy losses.

[51] Sir Percy Cox in his paper in the *Journal* (66 (1925) 193–227) expressed surprise that the Arabs in the Dhahira and in Oman always called him the Christian instead of the Consul. The Arabs in these parts however refer to all Europeans as Christians, never as Englishmen or Americans, and to-day Bertram Thomas is rarely referred to by name but usually as the Christian, and similarly my companions speaking among themselves usually spoke of me as the Christian (Al Nasrani) though they addressed me as Umbarak, an Arabic name which they had given me to avoid the difficulty occasioned by pronouncing my own name.

[52] The *falaj* is an underground water channel, dug out by means of shafts sunk every 20 to 30 yards and joined up under ground; the mounds of excavated earth are a common feature of the Oman landscape. I have seen *aflaj* at Ghail ba Wazir in the eastern Aden Protectorate.

[53] The present sheikh of the Harth, Salih bin 'Aisa, son of the famous 'Aisa bin Muhammad, lives at Qabil. The sheikh of the Harth is recognized as leader of the Hanawis, while the sheikh of the Bani Riyam, Sulaiman bin Hamyiar, is head of the Ghafari tribes.

[54] See 'Arabia Felix,' p. 126, and "A new journey in southern Arabia," *Geogr. J.* 108 (1946) 133.

[55] In 1950 I passed some triliths in the wadi 'Amairi near the western end of Jabal Salakh. The surrounding hills were dotted with tumuli.

[56] The Habus villages consist of El Fatah, Ainan, Mudhaibi, Dhahib, Shariq, Radda, Washi, Zaidi, Wafi and Mitaila. There is an afternoon market at Mudhaibi where the Imam has a *wali*.

[57] The mountains of Oman are usually obscured by haze, at any rate from October until April. This haze frequently limits visibility to 8 to 10 miles, and is equally persistent whether the wind is from the north or south.

[58] It seems probable that snow sometimes falls on Jabal al Akhadar since Arabs, who are acquainted with hail, describe how in cold weather the mountain is occasionally covered with another substance "resembling salt."

[59] Maghadar, Sanau and Handhali are inhabited by Al Bu Rashid and by Suafa, and Sidaira by Hawasim. There is an afternoon market at Sanua where one of the Imam's *walis* lives.

[60] Vegetation in these wadis consists of ghaf (*Prosopis spicigera*), silm (*Acacia Ehrenbergia*), samr (*Acacia* sp.), rak (*Serra incana*), athal, marakh (*Periploca aphylla*), sidr (*Zizyphus spina-Christi*), shaukhir (*Gaillonia Aucheri*), niza (*Convolvulus microphyllus*), hadhaira (*Tephrosia apollenea*), athaba, ausqa (*Lycium persicum*), harmal (*Rhazya stricta*), qurliya (*Homalodiscus Ancheri*), niit (*Euphorbia Schimperi*) and ghailqa (*Pergularia tomentosa*).

[61] A Badu lad who wishes to seduce a girl sits near her at a party; he then pushes his camel stick through the sand until the hook is beneath her, and turns it over. If she jumps up he knows he is rejected but if she sits still he can count on her accommodating him.

[62] The following four villages are in the gap between the Hamra Duru' and the Hamma bu Khisa.

Fil (Duru'), Bisiyai (Bani Shikail), Habi (Al 'Amair) and Mamur (Al Shail). They all owe allegiance to Huwaishil who has a house in Mamur.

[63] See P. M. Game, "Rocks collected by W. Thesiger in Oman, Arabia 1946–47," *Bull. Brit. Mus. (Nat. Hist.) Mineralogy*, I, No. 1 (1950), 15–22.

[64] Saifam is inhabited by Bin Shikail (Ghafari); Ghafat by Bani Hinah (Hanawi); Jabrin by Atabah (Gh); Bahlah by Bani Riyam (Gh) and Kunub (Gh); Hamra by Abriin (Gh); Manah by Bani Hinah (H); and Abu Said; Firq by Bani Hadhrami; Sait by Bin Hinah (H); Kubara by Bani Qasas. The country along the wadi Saifam from Jabal Kaur to Fil belongs to the Khamais who are allied to the Duru' and are Ghafaris.

[65] They are Mabus, Ma'wal, Al'Ain, Qaima, Thaut, Saitia, Shuhum, Huwaidh, Hadan. There are said to be palm groves and springs in these villages.

[66] Araqi is inhabited by Abriin (Gh) and by Baluch but the castle of Ainain is inhabited by Bani Ghafar (H); Dariz by Bani Ghafar (H), Ibri by Ya'aqib; Aradh, Khadhal and Miskin by Bani Kilban (Gh); Kahnat and Haiyal by Bani 'Umr (Gh); Yanqal by Bani Ali (H).

[67] The following tribes inhabit the plains southwards from Ras al Khaima, which is inhabited by the Juasim. Khawatar, Ghafala, Al Ali (at Umm al Quwain) Taunaiq, Bani Kitab, Dhuahir, Naim, Al Bu Shams, Sualim, Baluch (at Mazam). The following tribes inhabit the western slopes of the Hajar, southwards from the Rus al Jibal, Shihuh, Habus, Mazari', Tuaihat, Shuaihin, Bani Ka'ab, Kanut, Ruashid, Muqabil, Shuamis (these last four tribes in the wadi Jizi) Naim, Bani 'Ali, Bani 'Umr, Bani Kilban.

The Juasim, who were notorious pirates in the early nineteenth century, inhabit Ras al Khaima, Al Manai' (in the wadi Qaur) Za'ab, Kalba, and Khaur Fakan.

[68] Villages of Aflaj Bani Kitab are Ma'mur, Filai Shaqaili, Faranji, Abu Khabi, Filai 'Umr.

[69] The word Oman is used by Europeans to denote all of south-eastern Arabia which lies to the east of the sands of the Rub'al Khali, but the Arabs who live in those parts generally use the word in a more restricted sense though not always of the same area. On the Trucial Coast they talk of visiting Oman when referring to Buraimi, whereas in Buraimi, and indeed generally throughout this part of Arabia, Oman is used to mean the Jabal al Akhadar and the settled country lying to the west of it and to the south of Jabal Kaur, in contrast to the Dhahira and the Hajar to the north, the Sharqiya to the south and the Batina or coastal plain to the east. I here use Oman in this restricted sense.

[70] See Colonel Miles, 'Countries and tribes of the Persian Gulf,' and H. St.J. Philby, 'The background of Islam.'

DISCUSSION

Evening Meeting, 17 October 1949

Before the paper the PRESIDENT (Sir HARRY LINDSAY) said: Mr. Thesiger is so well known to us that there is little I need say by way of introduction except that he is continuing his travels in Arabia. His journey on this occasion has been in central Oman, an area he has been the first Englishman to penetrate during the past fifty or so years. His detailed mapping of unexplored country is especially valuable in view of the changes which are likely to take place in southern Arabia in the ensuing years, for you will realize that the development of oil resources involves also the development of communications, including railways, with consequent changes in population concentrations and social geography.

This is the second occasion on which Mr. Thesiger has read to the Royal Geographical Society the opening paper of a session. This was not of his own seeking, though I am sure you are all glad that he is again to open our new session.

Mr. Thesiger then read his paper.

The PRESIDENT: You will I know agree that we have listened to a thoroughly interesting lecture. I admired particularly, apart from the interest of the lecture, the wonderful way in which Mr. Thesiger arranged both his slides and his maps. That was an illustration of human geography at its best. We had hoped to have with us this evening H.E. The Saudi Arabian Ambassador but unfortunately his wife is ill and he is not able to be here. In his place we are fortunate in having the Second Secretary at the Saudi Arabian Embassy, Abdul Rahman Halaissie. We hope he will be able to add a few words.

ABDUL RAHMAN HALAISSIE: It is a great honour to me to attend this lecture by Mr. Thesiger because it is of special interest to me coming as I do, not from the area he has described, but from a country not far distant. He has carried me back to my native land and especially to my people there. I hope to come to hear him speak on some future occasion about Arabia which is, after all, the area which interests me most.

Brigadier R. A. BAGNOLD: The President has already mentioned the excellent way in which Mr. Thesiger arranged the topography and the maps he has shown us. I have on a number of occasions heard Mr. Thesiger lecture to the Society, and I can recall that even on the first occasion I thought he was a man who had the knack of taking photographs of sand and desert scenery, a knack I have never been able to achieve. Since then his standard of desert photography has become even higher each time he has lectured to us in this hall. You will agree that some of the photographs seen this evening, especially those of the sand dunes, have been really excellent. It is most difficult to take a photograph which shows up a sand dune and its curves and contours against the sky, because there is so little difference in the tone of the light.

Mr. Thesiger spoke of Umm al Samim and the quicksands of von Wrede. Umm al Samim should not be called a quicksand, but a salt marsh; the word "quicksand" should be reserved for something rather more special. The salt marsh which Mr. Thesiger described is probably the same as the Sabkha in northern Africa and represents the final stages of a salt lake, when the salt has become so concentrated as to be almost solid; at any rate, there is a thick crust of salt crystals nearly all over it. The wind blows dust over the sticky salt crystals and the marsh is usually of a dirty yellow colour. In certain atmospheric conditions, especially after rain, water evaporates violently from the surface and there is an efflorescence of white powdery salt crystals which look like a covering

of snow. Underneath that there is the salt crust which may vary in thickness according to the level of the water-table immediately underneath it, and that depends upon the amount of rain or water coming into the half-dried-up lake. Underneath that again one finds either a liquid or, in many cases, something which is not a liquid and not solid but a kind of network of small salt crystals submerged in the water; when subjected to only light pressure it will maintain its shape, but if one breaks it it crumbles up and lets one through. In other words, if the pressure exceeds the weight it will bear, one sinks right through that crust. It is possible to get the same structure in sand in the dry state, a mass of very minute grains forming a network which will support a certain weight or withstand a certain amount of pressure. But there is no evidence, as far as I know, that such a dry quicksand has ever been found anywhere in the world except for depths of perhaps 6 inches or a foot. If one did by chance find such a dry network of minute crystals extending to a great depth, it would form a dry quicksand into which one might sink and become suffocated. Von Wrede's description, which Mr. Thesiger has quoted, sounds unreliable to say the least. He is said to have thrown in a plumb line which took five minutes for the rope to start moving in the dry mud or sand. That does not ring altogether true. In fact, von Wrede's quicksand has, to my mind, all the attributes of one of those mythical places about which one hears nearly all the way across north Africa; a place every Arab has heard about but has never seen; it is always somewhere else and he does not really believe in it. It is just a story, something more legendary perhaps than King Arthur, something having no real foundation in fact.

Mr. G. M. Lees: As one of the few in this hall who have visited Oman I would like to pay a tribute to Mr. Thesiger's account of his journey. It is about twenty-one years since I read a paper on the mountain country of Oman, which I traversed in several places when conducting a geological expedition, and because of the tribal complexities which Mr. Thesiger has so well described, I was unable to get farther into the desert country beyond. It has been fascinating to see his photographs and to hear his account of what, to me, was forbidden ground.

Mr. Thesiger revels in sand. It is a curious trait that a man should be willing to spend months on end going up and down sand dunes. From my point of view as a geologist, the mountains of limestone and the volcanic hills of which we saw a few pictures and of which Mr. Thesiger spoke are the fascinating features of Oman; the desert country with its vast sand mantle is most regrettable! Nevertheless, there are occasionally conspicuous features in the sands and Mr. Thesiger has made some interesting observations during the course of his journeys over the last few years. I sincerely hope he will be able to continue those journeys with equal success.

My interest, as you may have guessed, in the geology of Oman and the surrounding area, was connected with oil. So far the search for oil from the Middle East has not penetrated into Mr. Thesiger's beloved Rub' al Khali, and I think it will be a considerable time before it does so. Certainly I trust that I will not personally take part in that penetration because although I am willing to allow him his interest in sand, to live in sand in that type of country is not to everyone's taste.

You have probably not grasped from Mr. Thesiger's description exactly what life is like among the sand dunes. Imagine living in that sand country, day after day, week after week and, on some of his journeys, month after month. Mr. Thesiger described how they took a few dates, a little flour and a few bits of dried camel meat and mixed them up into a putty with a cup full of

water and ate it. And he called that life! It is fortunate for us that there are such strange people and that the sand harbours such a tremendous amount of interest for Mr. Thesiger; we owe him a debt of gratitude for his persistence in making his journeys and wish him every success in the further journey he is about to undertake.

The PRESIDENT: If there are no further comments I ask you to join in a most hearty vote of thanks to Mr. Thesiger for his admirable lecture. He has gone right into the heart of his subject and opened up to us new lands which may in the future become very important indeed, after the further explorations which are needed in order to make them better known. I know you all join with me in hearty thanks to Mr Thesiger and that you wish him still further success.

NEW BRITISH EXPLORATION IN NEPAL

PETER LLOYD

THIS STRANGE KINGDOM of Nepal is a magnet to draw any traveller. It is a country with a violent and dramatic history, the last century dominated by the epic figure of Jang Bahadur who, having taken power from weaker hands, survived the many plots of his adversaries and ruled the country so firmly and so wisely that the office of prime minister became hereditary to his family. It is a country closely linked to our own by ancient alliance and by the long association of the Gurkha regiments, but yet aloof, holding the western influence at bay and retaining a simple, even a medieval, character. Like the rest of Asia, it has now to face a new test, the impact of Communism on a poor and illiterate peasantry. Nepal is the birthplace of the Buddha, but is ruled by a Hindu dynasty, influenced by both China and India, yet independent of both. And Katmandu the capital has its own contrasts. It is set in a lovely and fertile valley at some 4,000 feet, but from any viewpoint a fine day will show to the north and north-east the clear line of the Himalayan peaks. The pagoda-like temples, both Buddhist and Hindu, are set beside the palaces and barracks of a later and western style. In the bazaars of the old town with houses decorated by the traditional Newar wood carving, the factory products of Calcutta and the surplus stores of the American army lie beside the grains and fruits of the Nepalese cultivators.

But of these things, fascinating though they are, I have but little to say, for it was as mountaineers and naturalists that we went to Nepal in 1949, drawn to a sight of this four hundred mile stretch of the Himalayan chain which includes so many of the giants: Everest with its satellites, Makalu, Kanchenjunga, Daulagiri and Anapurna, the great mountains of the world; and drawn especially by the lure of new country. It was a century since Hooker's classical journey to Eastern Nepal and since then no western traveller had seen much beyond the capital and the bordering foothills of the country. We counted it a rare privilege and opportunity to be able to go.

The area which the Nepal Durbar had given us leave to explore was that of the Langtang and Ganesh Himal, ranges on the Tibetan frontier eight days' journey to the northward of Katmandu, and I remember the faint regret that I felt on first realizing that this was, by Himalayan standards, a region of lesser peaks rising to not more than 24,000 feet. But I need not have concerned myself, for in the event we came much closer to one of the giants—Gosaintham—than the map had suggested, and in any case the smaller peaks were more than a match for us.

The Nepalese Government had made it a condition of our journey that, apart from exploring and climbing, we should also do some scientific work, and so paradoxically Tilman, the leader and organizer of our party, who has so often railed against the pretentions of science, found himself in charge of a scientific team. But I who had been climbing with him for many years had long since realized that Tilman's technique of Himalayan travel is in fact a

highly scientific method, exact as well as exacting, and I was not entirely surprised when Tilman showed that he was in fact an ardent and avid collector. Not only did he pounce upon the first *Meconopsis* or *Primula* of any seemingly new species that grew in his path, or for that matter on the crags above his path; he also slaughtered and preserved, all in the name of science, enormous numbers of miniature beetles. As for myself, I am a scientist by profession but it was as a mountaineer that I went on this journey, my objective a search but never a research.

Our botanist was Oleg Polunin of Charterhouse and our geologist Hamish Scott of St. Andrews University (whose secondary qualification it is to play Rugby football for Scotland) and at the appointed time the four of us, having crossed on foot the two passes that lead to the capital, duly assembled at Katmandu. Here we were most hospitably entertained by Lieut.-Colonel R. R. Proud of the British Embassy; his knowledge of the country and his generous help in a score of ways helped us over many difficulties and, after some hurried days of packing and preparation with the briefest visits to the palaces and temples of the valley, we set our faces to the hills. Our stores were carried by thirty local coolies, for Nepal in marked contrast to Tibet is seemingly a country without pack animals and all commodities—food, firewood, building timber—are laboriously man-carried from village to village. Our four Sherpas were in charge of Tensing, a much-travelled man who was already known to Tilman and me from the Everest expedition of 1938, and we had in addition an escort of Nepalese sepoys under the command of Lieutenant Sher Bahadur Malla, which had been put at our disposal by the Nepalese Government.

It was the end of May, for though we had been warned against travelling in the monsoon, the importance of our botanical work made it essential for us to cover the flowering and seeding seasons. But for the present it was typical pre-monsoon weather, hot in the valley and with occasional thunderstorms as the only reminder of the rains that were to come.

Our first night out from Katmandu was a memorable one, for on a clear evening we looked out from our camp, set in the terraced fields of what might have been a Garhwal village, across the long forest-covered ridge of the Gosainkund Lekh to the snow peaks for which we were bound and, as the night came on, the fields were as bright with fireflies as was the sky with stars. We were not to know that this was to be our last starlit night for many weeks.

The road to the frontier lay up the valley of the Trisuli which, as the Bhote Kosi, cuts its way like the Arun through the main Himalayan range. Along the ridges to the east of us ran the parallel trail that the pilgrims follow in their annual journey to the holy lakes of Gosainkund. Here Mahadeo, having drunk up the poison with which Siva sought to destroy the world, stabbed the ground with his trident spear and made the lakes to slake his thirst. Our lower road led us first across the fertile fields of Nawakot and Trisuli Bazaar; then, as the valley narrowed, across the terraced slopes and deciduous forests of its middle reaches, and at last to the upper gorge. As we found later, this part of Nepal is indeed a country of gorges and ravines and swift flowing streams, a country hard enough to traverse along the grain but surely heart-breaking across the grain of ridges which are often steep, and rivers which are often

unbridged and unfordable. More often than not the rocky trails escape from the steep slopes of the lower valleys and run along the ridges, a device that makes for quicker movement but can have its disadvantages for travellers without local knowledge of the springs and water courses. But it is just this difficulty of travel which gives Nepal its character and variety, for each valley, cut off from its neighbour, has developed and perpetuated its own speech and custom. Even within the limits of the Trisuli and Bhote Kosi valley systems we found the greatest variety of race and character, each village seeming to have an atmosphere of its own. And the few phrases of Nepali which I had learnt before leaving England were of but limited value to me, for the dialects that we heard spoken in the villages bore little resemblance to the *lingua franca*.

The Bhote Kosi cuts through the main range between the Ganesh and Langtang groups. Rasua Garhi, the frontier post at 6000 feet in the bottom of the gorge, is within 6 miles of a 21,000-foot mountain. The hundred-year-old fort on the Nepalese side of the frontier is a reminder that these rough trails have at no distant time been roads for invasion, for in 1792 the Chinese, angered by the Nepalese incursions into Tibet, sent a force down the Trisuli valley and penetrated as far as Nawakot before peace was signed; and again in 1855, the period from which the present fort is said to date, the Nepalese advanced into Tibet to withdraw a year later after inconclusive fighting. But now there is an air of make belief about the little fort, so much less formidable than a Welsh castle, and about its little garrison. The embrasures stare vacantly across the frontier line at the empty valley which leads up to Kyirong and the Tibetan plateau.

But our road lay first up a side valley, the Langtang, to the more easterly of our two ranges and two days' ascent brought us above the rain forest to a most picturesque and attractive village, with well-built houses of wood and stone and long Mani walls set among fields of wheat and barley, buckwheat and potato. (This latter was first introduced to Nepal from the garden of the British Resident at Katmandu.) The village was essentially Tibetan in character and the people were, as we soon learned, of Tibetan origin, hailing from Kyirong. They were Buddhists and indeed stricter Buddhists than are most of the Tibetans, for though they were mainly herdsmen, their wealth being made up of the yaks, cows, horses and sheep that grazed the upper meadows, they would take no life nor suffer others to take life within the valley. It was for their wool and milk that the flocks and herds were kept, butter being the most important commodity. This scruple about the slaughtering of beasts was something of a blow to us who had counted on buying an occasional sheep for the pot, and it meant that while we were in the Langtang valley our fresh meat ration was limited to the carcass of a sheep killed by an impious bear and to the infrequent by-products, monal pheasant or snow pigeon, of Polunin's collecting.

The middle part of the Langtang was a long glacier-worn valley bounded to the north by steep rock walls rising abruptly to Langtang Lirung (23,771 feet) and its satellites, while to the south gentler slopes led to lesser mountains of some 19,000 feet. It was a valley rich in flowers and shrubs, dominated when we arrived by a slender iris, later by anemone and fritillary, and later still by a delphinium lovelier even than the gentians. On the southern slopes,

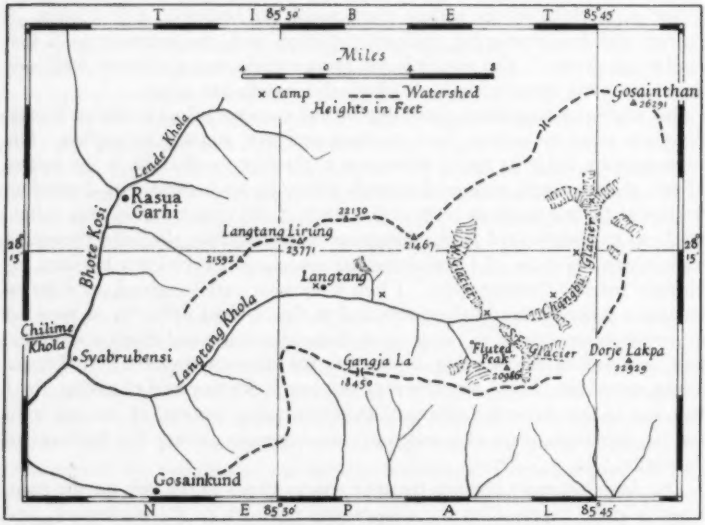
remote from the main area of cultivation and grazing, were woods of birch and rhododendron, dotted with clumps of a sweet-scented *Primula* and alive with finches. Higher up on the moraines and screes it was the flowering shrubs that predominated, dwarf *Rhododendron* in many colours and varieties, *Spirea, Cotoneaster,* juniper and a sweet-scented *Lonicera* which on a still day would fill the air with its fragrance. Many of these plants that we found in the Langtang had been collected by Hooker on his journey through Eastern Nepal to the Walung pass, and several of his descriptions could equally well have been applied to the Langtang. One of the most intriguing, which appeared later and at higher altitudes, was what we at first called the "woolly cabbage" and Polunin later identified as a *Saussurea.* Hooker found this, or another of the same genus, on the top of the Walung pass and writes of it: "it forms great clubs of the softest white wool, six inches to a foot high, its flowers and leaves seeming uniformly clothed with the warmest wool that nature can devise." The woolly leaves form a shield over the flower with only a small central opening through which the insects can enter.

But while enjoying these pleasures, we had our eyes raised to higher things, for there were mountains here to climb and new country to explore. The existing map, made by native surveyors of the Survey of India in the course of two short seasons, was good enough within its limitations, but showed an understandable vagueness in its delineation of the upper part of our valley, while to the northward in the direction of Gosainthan, the holy mountain with which the lakes of Gosainkund are associated, there lay a big area invitingly marked "unsurveyed." I had somewhat rashly agreed, in spite of complete inexperience in these arts and of the obvious difficulty of working in monsoon conditions, to bring out a photo-theodolite and attempt a survey, and now before the weather broke was the obvious opportunity. Tilman might have been, but I was certainly not yet fit for any real climbing, for I had first to live down the effects of an eleven years' interval of absence from the big mountains and of a sedentary month spent among the fleshpots of Australia.

Our first and most obvious thought was to climb to the cols on the main frontier ridge overlooking the unsurveyed territory to the northward, and several cols were visited with this intent. The views that rewarded these exertions were not always helpful, for more than once we found ourselves overlooking, not the new country on the Tibetan side, but some tributary glacier of our own valley system. But one of these false cols, the first high survey station that I established, did at least give a general view of our own valley with its tributary glaciers and its mountains. It showed us in particular Langtang Lirung (23,771 feet), the highest peak of the group with relatively easy snow ridges above but steep rock below; "Fluted Peak," the shapeliest in the valley, and a mountain with which we were later to become intimate; and away at the head of the Langtang glaciers a great rocky bastion curiously reminiscent of Gosainthan as we had seen it from a view point in the Katmandu valley, but not separated from us by any frontier ridge. It showed us too that the main Langtang or Changbu valley was joined, not far below the snout of its long glacier, by two big tributaries, one which we directly overlooked flowing from the north-westward and giving access to the

frontier ridge, while the other drained the mountains at the eastern and south-eastern end of the group. This junction of three valleys where the great moraine of the north-west glacier debouched across and almost blocked the main valley was a focal point which made a useful base for later explorations of the two branch valleys and the cols to which they led.

Having failed in our first attempts to reach the frontier ridge in the region of the middle Langtang, we made it our next objective to explore the main valley and reach the head of its glacier system. Starting from a camp just below the junction and making some surveys on the way, it took us three marches to get there, and again we found a junction of three main glaciers each sending in its tributary stream of ice and rock, and making such a desert



The Langtang Himal

of moraines as only the Himalaya can produce; a horrid prospect of rotten shattered rock. But above this glacier world of decay and disintegration rose the steeper snows and the fine mountains of the watershed, dominated by a big wedge-shaped mountain that we later identified as the same "mock Gosainthan" that we had seen from the earlier survey station. And from the valley head we were able to push up a bivouac within reach of two easy cols and so at last to set foot on the main ridge; it was June 20 and, thanks to the lateness of the monsoon, the weather was still fine. But the view that we saw gave no simple answer to the topographical problem. A tangle of unnumbered lesser peaks stretched away toward the Tibetan plateau, but of Gosainthan and its satellite which we had expected to see dominating the view to the northward there was no sign. Below us on the Tibetan side a big glacier flowed westward to feed some tributary of the Bhote Kosi. To the south-

westward lay the peaks of the middle Langtang, their configuration confused by the sharp northward bend of the upper Changbu glacier.

A second and higher col on the main ridge and a number of other survey stations in the vicinity failed to provide much further evidence and now the worsening weather was making many difficulties in this work. Survey stations had to be established at dawn or soon after, and even then the clouds would often come up too fast to allow of useful observations; by mid-day the snow on the upper glaciers was so soft as to make their crossing a purgatorial journey. These difficulties, reinforced by the exhaustion of our supplies, made us turn back toward our base for there was little more that we could do.

The results of this work seemed inconclusive, but combined with other observations taken later from the middle Langtang it has at least shown certain things. The upper Langtang valley system extends far beyond the limits marked on the present map and drains a large part of the "unsurveyed" region. A second large glacier northward of the Langtang and of the Tibetan frontier also flows westward from Gosainthan draining towards, and presumably into, the Lende Khola; a conclusion which confirms the earlier maps. Gosainthan itself cannot be far north of the frontier and is most probably the dominant peak on the main ridge, in which case the Langtang valley and hence Nepalese territory must run right up to it, again confirming the drawing of the earlier maps.

It was now the end of June and time for us to start thinking seriously of a mountain. Our thoughts turned first to Langtang Lirung which, as seen from the Katmandu valley, had appeared an easy snow mountain with a long gently sloping western ridge. But from close range, the mountain did not look so easy; the west ridge seemed quite inaccessible from the south, the long south-east ridge though not impossible looked to need a long assault by a strong party, and the east ridge though it finished easily was again inaccessible from the Langtang side. Under these circumstances, our decision was to try an approach from the north and with facile optimism we reminded ourselves that the northern slopes, further removed from the origin of the monsoon, would give us better weather.

The move down to a new base at Rasua Garhi, which was to be the starting point for this attempt, was soon made and we found without difficulty a guide who offered to lead us across the steep slopes which run down from the mountain to the Lende Khola. But the story of the attempt is soon told. A three days' climb brought us to a misty lake, the Dudh Kund, at some 12,000 feet. But the mountain which rose above it was not Langtang Lirung but its 21,000-foot neighbour, a mountain of steep faces and jagged ridges which did not in any way invite a change of objective, and to reach the Lirung itself we had a long rising traverse to make over steep and broken ground seamed by the deep gulleys and rocky ridges plunging to the Lende Khola below. Our attempt to force this route, in the course of which we descended some thousands of feet without finding a feasible way across what was evidently but the first of many obstacles, convinced us without question that the route was impossible and we returned through heavy rain in acknowledgment of our defeat. The Lende Khola, which might have provided an alternative road to the base of the mountain, was of no help for its southern wall rivalled

the Rishi gorge in steepness and the northern bank up which the trail ran was closed by the political barrier of Tibet.

And so, baulked in our climbing plans, we adopted the traditional tactics and moved to a fresh area, the Genesh Himal, lying westward of the Bhote Kosi gorge. We found at once that this was territory of a very different character, for the Chilime valley, unlike the Langtang, was open and fertile in its lower reaches with its main villages set below the 6000-foot contour. The people were Tamangs, cultivators rather than herdsmen, with that difference in character and temperament that the easier life of the lower altitude seems to imply. The local coolies whom we recruited here bore no comparison with the sturdier men of Langtang and their villages were crowded and dirty. But the place had its compensations for us in plentiful supplies of eggs and potatoes, maize and honey.

Down here the valley still held the sun, which seemed to cut its gully of light through the pervading cloud, but as we climbed up through the rain forest we came quite suddenly into a sullen world of cloud and rain and dripping vegetation. On our first night here my tent had such a battering from the rain focused on to it by the trees that it gave up all pretence of waterproofness and I spent the night awash. We had had leeches before and were to have them again, indeed we even had the horror of leeches that invaded our tents and sleeping-bags at night, but never were they so numerous or so cunning as here. They were a malignant presence, continually threatening and having that uncanny, sightless sense that leads them to their victims. And when after a three days' march from the valley we at last got above the leech-infested zone and found the welcome shelters of the shepherds who worked the upper grazings, the rain was still unabated. They told us that it rained most days and had in any case done so for the past eight. All our tents, made for snow rather than rain, were by now giving at the seams and leaking steadily, and we found ourselves preferring the more adequate shelter of the bamboo matting which the shepherds used to roof their huts; indeed we spent many an hour squatting and slowly drying ourselves in these huts over the smoky fire, with the shepherds sucking their "hubble-bubble" pipes and the lambs and kids penned beside us. We blessed too the light-weight tarpaulins which we had brought, for these, rigged over an abandoned hut or the end of a convenient rock, could always be relied on to make a dry cookhouse.

But even this world of cloud had its dry intervals and in the first of these, as soon as we could pick up bearings, we made an attempt on Paldor (19,451 feet), the most southerly point of the Ganesh chain and the most accessible to us. This gave us our first and as it proved our only mountaineering success; for after camping at some 17,500 feet in some doubt as to the whereabouts of the mountain we were seeking to climb, we found ourselves blessed with a fine day and with a route unfolding happily and without difficulty before us. But though we climbed in sun the clouds were piled all round us and a glimpse of an unidentified snow peak to the westward was all our view.

The rest of our time in the Ganesh went to collecting, to the study of the ice structure of a typical glacier and to the hopeful search for a feasible route up the main peak of the group, a fine 24,000-footer on the Tibetan

The summit of Paldor

Langtang Lirung from the "Red Coolin"

The Tibetan frontier: bridge over the Lende Khola

frontier. But the two routes that we found each had their drawbacks. The first had a steep passage low down on the ridge which would have taxed a very strong party, the second seemed to have little climbing difficulty but was protected in its lower part by a long rocky passage swept by falling ice, and at this season of warm nights, with no frost even at 19,000 feet, there was no period safe from this threat. Earlier or later in the season the risk could well have been taken, but not now. Our retreat to the valley was made in the same whole-hearted rain that we had learned to expect of the Ganesh and at the end of a long day's march we witnessed what I had thought never to see, a Sherpa unable to make a fire go.

Back in the Langtang valley on August 1 we had three weeks left before the party was due to break up. The first task was to round off the survey work, and in spite of the monsoon weather I got some useful observations in the middle Langtang region and also made a reconnaissance of the south-east valley, reaching a col on the southern watershed. In the meantime Tilman explored the north-west valley and confirmed that this led to a col overlooking the big westward-flowing glacier which we had already found. The Tibetan side of this col was too steep to be descended with coolies. The south-east valley contained a feasible-looking mountain, and we were also drawn by the idea of forcing a passage of the col at the head of the north-west valley, but after long debate we decided against both these plans, unable to resist the alternative attraction of Fluted Peak. Though barely 21,000 feet, this was the dominant peak of the middle valley and a lovely thing with its narrow ridges and furrowed faces of steep snow. We had seen it from every side save the south and knew that there was one possible route, from the west, up a long snow ridge broken at about 20,000 feet by a great flat step that looked a quarter-mile long. We went up into yet another side valley to find the ridge foot. Thick weather had become the rule, even in Langtang, and we now struck such a spell of it that for two days we were quite unable even to locate our mountain and spent our time in arguing pointlessly over its whereabouts, a process for which a doubtful map gives endless scope. But at last, on the third day, a momentary clearing gave us the bearing we needed and let us establish a comfortable base camp on the grassy floor of a little valley beside the glacier.

The next day we carried up the little "Meade" tent to make our final camp. We set it on a little rock platform at about 19,000 feet, just below a steep lift in the ridge, for though we would have preferred it higher we found ourselves having to choose between wet snow lying on ice and rocks so rotten that the whole mountain seemed in danger of falling about our ears. Neither place was right for laden porters. The little tent seemed somehow much smaller than the similar one in which we had last camped together on Everest.

But we were driven down next morning by a fall of snow in the night that made climbing conditions hopeless, and our second attempt, using a rather better line of approach to avoid the ice cliff, was little more successful. Again it was a frostless night with periodical rock falls down the gullies. Above our new camp site was a rock spur, steep and rotten but quite feasible, and up this we made good progress; but it petered out just below the step of the ridge, leading us out on to snow. As we had feared, this was sodden slush,

lying insecurely on its bed of ice with a trickle of melt water running through it, the very stuff that avalanches are made of; indeed, we could see the scars of the recent avalanche tracks on the slopes above us. Even ignoring the avalanche hazard we could only climb on by the slow process of cutting steps through to the underlying ice, an impossible task at that height and on a mountain of that size. The decision to turn back was inevitable.

A few days later Scott and I, with Angtharkay and three local men, crossed the Ganja La on the direct route for Katmandu and the plains, and for a send-off the mountains gave us the wettest week of the whole summer. Tilman and Polunin stayed a fortnight longer for the seed harvest before they too followed us.

It has been a disappointing ending to a season of limited achievement, a year of rains and moraines, of bad rock and rotten snow, but each of us in his different way had found compensation. Polunin especially had a tangible result to show in his collection of some 2000 flowering plants and ferns, 300 butterflies and moths, 500 other insects, 270 bird skins and so forth. and when these have been sorted and examined there should be an interesting story to tell. Scott too had his material results, and if the geological structure was less varied than he had hoped to find, there were some interesting rocks and minerals. To me it will remain a memorable year in that it gave me a fuller appreciation and understanding of the life and character of a mountain region than I had ever got before.

DISCUSSION

Evening Meeting, 20 February 1950

Before the paper the PRESIDENT (Sir HARRY LINDSAY) said: Mr. Lloyd is a scientist on the staff of the Ministry of Supply but he has also an interest in mountaineering, as will be illustrated in his paper. He has won a reputation as an experienced Alpine climber and he accompanied the Everest Expedition in 1938, reaching a height of over 27,000 feet. It so happens that I have a personal link with Mr. Lloyd, for to reach Nepal on the expedition he is about to describe he had to pass through my old district of Muzaffarpur in Bihar. That is purely a personal reminiscence to which I do not now propose to add.

Mr. Lloyd then read his paper

The PRESIDENT: We are indeed grateful to Mr. Lloyd for a most fascinating account of his journey and for wonderfully good photographs. The coloured photographs fitted in so well with each other and exactly described the lecturer's remarks. We were to have had the pleasure this evening of the company of H.E. The Nepalese Ambassador; unfortunately he has been detained in Paris, but he is represented by the Chargé d'Affaires, Professor R. B. Manandhar. We welcome him with great pleasure and we also welcome the Provost of Eton and President of the Alpine Club, Mr. Claude Elliott. The expedition described by Mr. Lloyd was led by Mr. Tilman, on whom I now call.

Mr. H. W. TILMAN: I am sure we are all extremely grateful to Mr. Lloyd for his lecture and certainly I can assure you that I am myself profoundly grateful to him because had he not spoken to you to-night I should have had to do so, and I notice here a somewhat formidable gathering of scientific folk in whose presence I might have felt it somewhat embarrassing to speak.

As you will have gathered, the climbing we were able to attempt was disappointing to both Lloyd and me, and that quite apart from the weather which is always a convenient scapegoat to all unsuccessful mountaineers. One reason for our failure was the lack of singleness of aim, by which I do not mean to imply that the presence of the scientists impaired our aim, but that we were perhaps trying to combine the exploration of a large mountainous area, in which we were fairly successful, with the climbing of the peaks. As a result our efforts on the peaks were somewhat hurried and off-hand, whereas in the Himalaya the climbing of a peak usually demands a great deal of time and undivided attention. Personally, I think that in new country such as we traversed, the urge to explore is hardly to be withstood and that the climbing of peaks becomes a rather secondary aim.

Another disappointment was our failure to get a definite line on that elusive peak Gosainthan, 26,291. As you have heard, we think the picture you saw was not the false Gosainthan but probably the true one, in which case it will stand on the frontier ridge, and not a good many miles north of it as shown on the present maps. It also stands on the watershed between the Sun Kosi and the Trisuli. There is no doubt whatever that the glacier from which we looked down into Tibet drains into the Lende Khola and may possibly drain the western side of Gosainthan. I am confirmed in my opinion that it drains into the Lende Khola by a map I have seen recently, drawn by Aufschnaiter and shown me by Colonel Tobin, Editor of the *Himalayan Journal*. Aufschnaiter is an Austrian climber who did some mountaineering in India in 1939. When war broke out he was interned at Dinajpur, but escaped with several others and got clear away into Tibet, and in the course of time—pretty nearly two years—arrived at Lhasa where he still is, running the power station there. In the course of that extraordinarily interesting journey he stopped at Langtang for ten months, exploring the surrounding country and making a map. He visited the snout of the big glacier at which we looked and he shows it draining into the Lende Khola, but even on his map there is no indication whatsoever of Gosainthan.

The only criticism I have of Mr. Lloyd's lecture, which was far more lucid and more neutral than I should have made it, is that the slides were rather personal and that neither the scientists nor the mountaineers showed to much advantage! I hope none of the laymen present to-night are sufficiently irrelevant and simple-minded as to ask of Little Peterkin, "What is it all about?" because I should have to reply, with Old Caspar, "I cannot tell." We hope to produce some maps, and there are a great many plants and other things in a building in Cromwell Road awaiting resurrection. There are a large number of pieces of the Himalaya up at St. Andrews where they are, no doubt, being scrutinized by means of microscopes by those few people there who do not play golf! What the final upshot will be and whether the journey has been worth while—I personally am sure it was—I must leave to some of our more learned speakers to decide.

I see the Nepalese Chargé d'Affairs here and I should like to take this opportunity of assuring him that we were most grateful for the permission to visit Katmandu and for the great kindness and help we received when we were in that part of the world.

Mr. POLUNIN: Of particular interest in the area we visited were the sacred lakes of Gosainkund which lie to the south of Langtang, an area where Hooker, one of the earliest and most renowned of botanists, collected in 1820. This inspired us to bring back plants, for those described by Hooker represent some of the earliest ever received from Nepal and very few plants have since been

collected from these mountains. In 1927 the Maharajah of Nepal kindly arranged that two Nepalese collectors should go to the mountains and send back plants and seeds to England as a present to King George V. They made an interesting collection, including the beautiful *Meconopsis Regia* named after King George and one or two excellent and delightful *Primulas*. The collection included both pressed plants and seeds, and some of them are now in cultivation in Great Britain. It was therefore of particular interest to me to search for the same plants and for other new ones. When we returned I found that there was nothing new in the collection of particular interest to the horticulturists, though it contains some interesting plants. I also set out to collect birds, because again our collections date from the time of Sir Brian Hodgson who was British Resident about a hundred years ago. He collected a large number of birds from the valley of Katmandu and employed native collectors in the hills. Various problems as to the distribution of species and races have not so far been resolved and I hope that some of the birds I collected in the mountains will help to solve them. So far the specialists have not got their claws into the birds and I cannot give any details.

Mr. D. BAGLEY: As a guest of Nepal on two occasions, I was particularly interested in Mr. Lloyd's remarks on a part of the country unknown to me, covering an area to the north of the valley. Hitherto, the limits assigned to the foreign visitor were usually the valley boundaries and the direct approaches, and these reveal the agricultural and industrial tendencies of a well-defined district, which one suspected would be in marked contrast to others as Mr. Lloyd has disclosed. Hooker indeed gives us some information of the western parts of the country, but to what extent these have changed in the intervening years only the Nepalese authorities can say.

With a view to the furtherance of exploration I discussed with H.H. the Maharajah's predecessor, about twelve years ago, a somewhat similar expedition to that undertaken by Mr. Tilman and Mr. Lloyd. At that time His Highness had in mind the utilization of the waters of the Sun Kosi and I later sent him a copy of Wager's paper on the drainage pattern of the Himalaya,[1] with a recommendation that further exploration would yield most useful data. His Highness was on the point of retiring, and thus no action was taken, but I sincerely hope that His Excellency the Ambassador will be able to advise a continuance of this exploratory work.

A glance at the map of Nepal reveals probably one of the most mountainous countries in the world. Fortunately for her economy she is blessed with wise rulers and doubtless the supreme questions of food and employment constantly engage their attention. Nepal's natural resources have not been fully explored. The potential hydraulic power from the principal rivers is immense, yet the difficulties of harnessing this source of energy are great, and include the probability of seismic disturbance. A controlled water supply would greatly increase the possibilities of irrigation, and land hitherto regarded as useless might be brought under cultivation. Cheap power might be provided for industry and for the production of fertilizers, and an exportable power surplus would be welcomed by India. Last but not least, it would prevent some part of the loss of soil now carried away to the Bay of Bengal.

The PRESIDENT: It only remains for me now to ask you to pass a most hearty vote of thanks to Mr. Lloyd. We have all thoroughly enjoyed his lecture and his slides and we do most sincerely express our gratitude to him.

[1] *Geogr. J.* 89 (1937) 239–50.

HEYERDAHL'S HYPOTHESIS OF POLYNESIAN ORIGINS: A CRITICISM

ROBERT HEINE-GELDERN[1]

THOR HEYERDAHL's courage and spirit of enterprise and his brilliant achievement in crossing the Pacific with the raft *Kon-Tiki* deserve of the highest admiration. On the other hand his hypothesis concerning the alleged American origin of the Polynesians, as set forth in the March issue of the *Journal*,[2] should not be allowed to pass unchallenged.

Heyerdahl deals with the linguistic question rather casually, asserting that the Polynesian languages are "only remotely related to the Malay tongues."[3] Even if this were true it still would mean that some kind of relation, be it ever so remote, exists between the Polynesian and Indonesian languages, whereas no such link exists between the languages of Polynesia and America. The fact that a few Polynesian words have been traced in South American languages and that one single word of Quechua origin—the name for the sweet potato (*kumara*)—is known to occur in Polynesia proves that some contacts have taken place between the two regions, but no more. Thus his thesis is hardly compatible with the linguistic situation.

He lays great stress on what he calls Polynesian racial "extra-Malay features, such as fair skin, tall stature and frequently aquiline nose" which "must have been acquired by the Polynesians after their separation from the Malay stock, yet before their own departure into the Pacific Ocean."[4] He thinks that these racial characteristics could be more easily explained by assuming some connection with Peruvian Indians. It may be admitted that the origin of the European-like Polynesian type poses a problem, but there is nothing in it that would be incompatible with derivation from Asia. Heyerdahl does not seem to be aware of the highly complicated racial situation prevailing in east and south-east Asia and of the wide range of nose shapes and of pigmentation, from very fair to dark brown, found in these regions. The occurrence of European-like types has been frequently reported, particularly from south-west China and from central Celebes.[5]

Nieuwenhuis, who as an anthropologist and as a physician with long experience in the eastern tropics was doubly qualified, suggested a very plausible explanation for the superior stature of the Polynesians and for the preservation among them of a racial type which in Indonesia has survived only in traces: the absence of malaria and of venereal and other contagious diseases from the Polynesian islands and their pernicious effect on the population of the Malay Archipelago.[6] Nor should we forget that the

[1] Professor Heine-Geldern is Professor of Ethnography in the University of Vienna, and has studied particularly the archaeology and anthropology of south-east Asia.

[2] "The voyage of the raft *Kon-Tiki*," *Geogr. J.* 115 (1950) 20–41.

[3] *Ibid.*, p. 20.

[4] *Ibid.*, p. 21.

[5] Eickstedt (1944), pp. 144, 167, 168, 172–174; Sarasin (1906), pp. 74–76.

[6] Nieuwenhuis (1930).

Polynesians were practically isolated after they had entered the Pacific, whereas the peoples of Indonesia were constantly exposed to racial mixture with later waves of immigrants from the Asiatic continent. Thus it is not altogether surprising that the Polynesian type eventually succumbed there under the double impact of malaria and of submersion by alien and numerically superior racial elements.

As for the alleged resemblance between Polynesians and Peruvian Indians, I may quote an observer who was certainly competent to judge. In 1770 two Spanish men-of-war were dispatched to Easter Island by the Viceroy of Peru. Their officers must have been familiar with the look of Peruvian Indians and it is therefore significant that one of them expressly stated with regard to the Easter Islanders: "They are in hue like a quadroon, with smooth hair and short beards, and they in no way resemble the Indians of the South American continent." [1]

We are told in Heyerdahl's paper that "since it is recognized that the Polynesians entered their present islands in the Christian era and brought a notably ancient neolithic culture with them to all the islands, they must have lost all contact with Asia and Indonesia at a very early period and spent the intervening millennia either in complete isolation, or in areas that remained in the realm of the polished stone age almost up to our time." [2] Heyerdahl seems to harbour enormously exaggerated ideas concerning the age of the knowledge and universal use of metals in eastern Asia and Indonesia. Let us look at the facts.

In the cemetery of Dong-so'n, in northern Annam, polished stone adzes occur together with tools and weapons of bronze and iron.[3] As Karlgren has shown, the earlier sepultures may date from the fourth or third centuries B.C., but the fact that coins of the Chinese emperor Wang Mang (A.D. 9 to A.D. 22) have been found there proves that the cemetery was still in use at least as late as the first quarter of the first century A.D.[4] Olov Janse expressly states that he found stone tools in the stratum which corresponds to the Han period.[5] Thus we have proof here that stone tools were still used in northern Annam between 200 B.C. and A.D. 20, if not later.

The big city which has been discovered at Go Oc Eo in Cochin China and which was probably the main harbour city of the kingdom of Fu-nan flourished already in the second century A.D. It was directly superimposed on a neolithic settlement. "Un fait est certain," writes George Coedès, "c'est que là comme dans beaucoup d'autres établissements hindous de Malaisie et d'Insulinde, les commerçants venus de l'Inde s'étaient installés sur un site occupé par des aborigènes dont la civilisation n'avait pas encore dépassé le stade néolithique." [6] Since the kingdom of Fu-nan was probably founded in the first or the early part of the second century A.D., this means that in the coastal regions of Cochin China the use of stone tools persisted until that date. The following observation by Olov Janse indicates that it may have survived in parts of southern Indo-China until around A.D. 1000 or even later. "It is obvious that the shouldered stone axe was in use in Indo-China

[1] Corney (1908), p. 127.
[2] *Geogr. J.* 115 (1950) 21.
[3] Goloubew (1929).
[4] Karlgren (1942), pp. 5–8.
[5] Janse (1936), p. 42; (1947), p. xviii.
[6] Coedès (1947), pp. 195–196.

as late as in the time of the Sung dynasty, perhaps even later. Thus we have found shouldered stone axes accompanied with Sung and post-Sung ceramics, both on the 'prehistoric' site on Tortoise Island near Biên-hoà in Cochin China and at Châurê near Phan-rang, province of Binh-thuân, southern Annam."[1] In the Philippines the Neolithic, according to H. Otley Beyer, ended around the beginning of the Christian era,[2] and this date would seem to be too early rather than too late. On the island of Sumba in the Lesser Sunda Islands, a stone adze was found in the urn cemetery of Melolo. The ceramics of the latter cannot antedate the second half of the first millennium B.C. and may very well date from the first millennium A.D.[3] On the basis of the ceramics found by P. V. van Stein Callenfels at Kaloempang in Celebes, I had dated the neolithic site there in the latter half of the first millennium

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B.C.[4] H. R. van Heekeren, who recently made new excavations there and who had the soil examined by a specialist, is however of the opinion that the neolithic settlement of Kaloempang is no older than six hundred years, which would take us into the fourteenth century A.D.[5] I am inclined to consider that estimate as being too late, but in any case a date not prior to the first millennium A.D. would seem quite likely.

I have listed elsewhere a considerable number of tools and weapons made of stone, bone, shell, wood or bamboo which were still used in continental and insular south-east Asia in the nineteenth or even in the twentieth century.[6] They must be considered as survivals from neolithic cultures which cannot be very distant from our own time. In general we may safely assume that in many regions of eastern Indonesia the use of stone tools

[1] Janse (1947), p. 57.
[2] Beyer (1948), p. 95.
[3] Heine-Geldern (1945), pp. 138, 148.
[4] *Ibid.*, p. 138.
[5] Heekeren (1950).
[6] Heine-Geldern (1923), pp. 862–863.

persisted into the first and perhaps even into the early centuries of the second millennium A.D. On the island of Engano, south-west of Sumatra and thus in western Indonesia, stone adzes are said to have been used for boat building as late as A.D. 1770.[1]

It may be objected that in Indo-China and Indonesia metal was already used side by side with stone in the pre-Christian era, as exemplified by the finds from Dong-so'n, while the Polynesians lacked every knowledge of it. The art of producing tools, weapons, and other objects of bronze was introduced in south-east Asia from southern China during the latter part of the first millennium B.C., possibly even as early as around 500 B.C. The iron technique must have become known in several regions of the area not later than the first or second century A.D. and perhaps even somewhat earlier. It is thus not inconceivable that the ancestors of the Polynesians, while still in Indonesia, might have come into contact with metal-using peoples or might even themselves have used metals to a certain extent. It is necessary to discuss this point because Heyerdahl, in an earlier paper, expressed the opinion that at no time could the Polynesians have known metals because, as he believes, "never yet did any people abandon the use of metal once it had been adopted, to return to the use of cumbrous stone implements." [2]

I do not think that any archaeologist of sufficiently wide knowledge will concur in that assertion; instances of the loss of the knowledge of metals abound. Thus the peoples who introduced the neolithic cultures of central and south-eastern Europe were, in part at least, descendants of ancestors who in south-western Asia had known and used copper. There can be little doubt that the neolithic painted pottery culture of China is either directly or, more likely, indirectly derived from metal-using cultures. Even more striking is the case of the Lung-shan culture, which flourished in China in the first centuries of the second millennium B.C. and which was purely neolithic although the people who introduced it came from the region south-east of the Caspian Sea, where their ancestors had been using metals for at least a millennium and a half. The decorative designs of the pottery from Kaloempang in Celebes, mentioned above, are unequivocal proof of derivation from a metal-using culture of south-eastern Asia. Yet the remains discovered there comprise not a single object of metal. Bronze-socketed axes have been found near Lake Sentani in northern New Guinea and, since they are distinguished by certain peculiarities not found elsewhere, there is a good chance of their having been produced locally. Yet the inhabitants of the region completely relapsed into the Neolithic.

It is not difficult to understand why the art of producing metal objects was apt to be forgotten in the course of migrations. Settling down in a new country, the ancient peoples were bound to lose all knowledge of the technique if they did not succeed in discovering deposits of ores within the first generation. Whether or not metal ores occur on any of the Polynesian islands I do not know. But even if the ancestors of the Polynesians had known how to produce and work metals, a sojourn in the course of their migrations of fifty or sixty years on coral atolls or other islands lacking ores would have sufficed to extinguish every trace of that knowledge.

[1] Modigliani (1894), p. 206.

[2] Heyerdahl (1941), p. 16.

Apart from this we ought not to forget that the distribution of metal techniques in Indonesia was far from uniform even in recent times and must have been even less so in antiquity. While some tribes knew how to cast bronze and forge iron, others lacked that knowledge although they used metal tools and weapons bartered or bought from their neighbours. This was particularly the case in several regions of eastern Indonesia. In western Indonesia too, the inhabitants of the Mentawei Islands and of Engano, as late as the nineteenth or the beginning of the twentieth century, had no idea of forging but used to reshape iron objects acquired from traders by hammering and grinding them cold—the neolithic method. There can be little doubt however that many tribes of eastern Indonesia did not even obtain metal tools by trade, and remained in the pure Neolithic until relatively late in the Christian era.

Thus Heyerdahl's main argument, that the Polynesians could not have come from Asia because they entered the Pacific with a neolithic culture in the post-Christian era, collapses completely. On the contrary, even if they really entered the Pacific as late as the first centuries of our era—which incidentally is not as certain as Heyerdahl assumes—it would have been nothing short of a miracle if they had reached their islands with anything else than a neolithic culture or a culture which, after having lost whatever knowledge of metals it once might have possessed, had become neolithic again.

There is another important point concerning stone tools which Heyerdahl has failed to consider. As I have shown elsewhere, the stone adzes and chisels of Polynesia are typically east Asiatic. The simple quadrangular adze can be traced from China through Indo-China, the Malay Peninsula and Indonesia to Polynesia, and the stepped and shouldered adzes of eastern Polynesia and Hawaii have their prototypes in the region from the Chinese coast around Hongkong through the Philippines to Celebes.[1]

In America quadrangular adzes are comparatively rare. They occur in the arctic region and in the eastern Woodland Culture, in eastern Mexico and, sporadically, in the Andean region. A highly specialized form of the stepped adze was used by the coastal tribes of southern Alaska and British Columbia; whether this may be derived from East Polynesian or, as seems more likely, directly from East Asiatic types, need not concern us. In no circumstances could the Polynesian stepped adzes be derived from those of the north-west coast of America since they resemble far more closely those of coastal China and the Philippines. From the whole of South America I know of only a single stepped adze, said to have been found in Ecuador. Shouldered adzes occur in the Pueblo region of the United States and in north-west Argentina. The scattered quadrangular and stepped adzes of the Andean region may very well be considered as traces of Polynesian influence, but they cannot possibly be the prototypes of the Polynesian adzes. Whether the shouldered axes of the Pueblo region and of north-west Argentina, or the quadrangular adzes of eastern Mexico, may be due to Old World influences or to independent development is too intricate a problem to be discussed in this place,

[1] Heine-Geldern (1932), pp. 566–597; (1936), pp. 35–36; (1945), pp. 134–142. See also Beyer (1948) and Hinderling (1949).

and is moreover completely irrelevant for our purposes. What really matters is the following.

Not a single specimen of any of the characteristic South American types of stone axes has ever been found in Polynesia. On the other hand, the various kinds of Polynesian stone adzes all belong to well-known east Asiatic types. Even the way they spread from the Asiatic continent, and while spreading developed, can be traced to some extent. I do not see how the thesis of the American origin of the Polynesians can be reconciled with these facts.

But let us look at a few more of Heyerdahl's arguments. Perhaps the most astounding of his statements is the following: "The megalithic monuments, the superior calender system, and success in surgical trepanning of the skull are among the culture traits of neolithic Polynesia that equal those of the world's leading civilizations, and they find no explanation in Indonesia and its vicinity." [1] Is it really possible that Heyerdahl has never heard of the magnificent and innumerable megalithic monuments of Indonesia and "vicinity"? More than twenty years ago, I compared the megalithic monuments of Assam, Indonesia and Polynesia and showed how closely they are related, not only in their forms but in their meaning.[2] Even before that Stutterheim had pointed out the similarity between the megalithic terraces on the Argopuro mountains in East Java and the Polynesian *maraes* and *ahus*, while Hutton had commented on the close parallelism between certain megalithic structures of the Nagas of Assam and those of eastern Polynesia.[3] To-day, with infinitely more data available from south-east Asia as well as from Polynesia, the relations between the megalithic monuments of the two areas emerge even more clearly.

In the appendix to his paper, Heyerdahl elaborates the question of megaliths by listing, among the elements common to Polynesia and Peru, "megalithic structures of stones carefully shaped and fitted without the use of such ancient Asiatic elements as iron tools and cement; terraced stone structures, stone stairways and great-stone platforms; stepped stone-work of religious significance in the shape of pyramids; the skill and techniques required to quarry and shape, with stone age tools, the solid slabs of stone; to transport them over miles of rugged country, without the ancient Asiatic invention of the wheel; the construction of paved roads." [4] He is evidently ignorant of the fact that terraced stone structures, stone stairways, stone platforms, stepped pyramids and paved roads abound in the megalithic cultures of Indonesia and continental south-east Asia.[5] He further seems to harbour some misapprehension concerning Asiatic megalithic monuments in thinking that they were built with cement. There can moreover be little doubt that the custom of erecting megaliths was introduced into south-east Asia long before the use of iron was known there.[6] Nor are wheels ever used

[1] *Geogr. J.* 115 (1950) 22.
[2] Heine-Geldern (1928), pp. 294–302.
[3] Stutterheim (1923); Hutton (1926), pp. 74–75.
[4] *Geogr. J.* 115 (1950) 32–33.
[5] Schröder (1917); Hutton (1921), (1926); Heine-Geldern (1928), (1934), (1945); Arndt (1932); Van der Hoop (1932); Rouffaer (1937).
[6] Heine-Geldern (1932), p. 594; (1934), p. 5; (1945), p. 149.

by those peoples of south-east Asia who erect megaliths for the transport of the stones; they either drag them on wooden sledges or carry them with the help of wooden or bamboo frames.[1] Far from "finding no explanation in Indonesia or its vicinity," as Heyerdahl believes, these structures belong to one practically continuous group of megalithic cultures which extends from continental south-east Asia through Indonesia, Micronesia and Melanesia into Polynesia, with only such local differences as may be expected to occur within such an enormous area.

No less surprising than his views about megaliths is his assertion, quoted above, that "the superior calender system" of the Polynesians "finds no explanation in Indonesia." In the appendix to his paper he points out that "the Pleiades were celebrated as the patrons of agriculture both in Peru and in Polynesia" and that in Polynesia "the new year is counted from the rising of the Pleiades precisely as was the custom in Peru."[2] But there is hardly any region in the Old World with more elaborate calender systems than Indonesia. There too the Pleiades are intimately connected with agriculture and in many parts of Indonesia the year is counted from the rising of the Pleiades.[3] As I have pointed out elsewhere, some traits of Polynesian time reckoning systems (ten day weeks on Niue and Hawaii, ten year cycles on Easter Island) have their closest parallels in China.[4]

I quote a few more examples to illustrate Heyerdahl's method. Among his "indications of prehistoric diffusion from Peru to Polynesia" he includes royal marriages between brothers and sisters in Peru and Hawaii, the sling, the bamboo nose flute and the venesection bow.[5] But brother sister marriage was practised by the royal dynasties of several of the kingdoms of south-east Asia; and what weight does the occurrence of the sling in Peru and Polynesia carry when it was used also in Indonesia and Melanesia? He quotes the use of the bamboo nose flute by the Maori of New Zealand and by the Botocudos of eastern Brazil, not, as we should expect, by the Peruvians. Is it possible that he is not aware of its wide distribution in Indonesia and Melanesia? For the venesection bow he refers to a paper by Ackerknecht and an illustration in one of Nordenskiöld's books. Yet Ackerknecht lists the venesection bow as occurring in Greece, Africa, New Guinea, and Central and South America, but not in Polynesia; the venesection bow illustrated by Nordenskiöld is not from Peru, but from Panama.[6] Ackerknecht moreover, in his chapter on medical practices in the 'Handbook of South American Indians,' reports the venesection bow as being found in Panama and among the Cayapó and Chavante of Central Brazil but does not mention Peru.[7] Heyerdahl asks us to accept the venesection bow as one of his "indications of prehistoric diffusion from Peru to Polynesia" although, as far as we know, it occurred neither in Peru nor in Polynesia.

[1] Hutton (1922); Rouffaer (1937), pl. 58; Röder (1944).
[2] *Geogr. J.* 115 (1950) 34.
[3] 'Encyclopaedie van Nederlandsch-Indie, Aanvullingen en Wijzigingen' (1922), pp. 65–79.
[4] Heine-Geldern (1938), pp. 877–880.
[5] *Geogr. J.* 115 (1950) 33, 35.
[6] Ackerknecht (1947), p. 29; Nordenskiöld (1931), fig. 2.
[7] Ackerknecht (1949), p. 629.

It would take a paper several times the length of Heyerdahl's article to disprove, one by one, all his arguments. However I think that the selection I have discussed will suffice to show that his hypothesis of the American origin of the Polynesians and of Polynesian culture cannot stand up to the facts. In general, Heyerdahl's method may be said to consist in listing various cultural traits found in Polynesia, as well as in America, omitting however to mention that these same traits occur also in Indonesia or eastern Asia. I certainly do not intend to question his good faith. Obviously, he has allowed himself to be carried away by his enthusiasm for a favourite idea. Moreover, he does not seem to be sufficiently familiar with the cultures of Asia and Oceania, a thorough knowledge of which is indispensable for a successful approach to the Polynesian problem.

Even though Heyerdahl's hypothesis is unacceptable from the point of view of comparative ethnology and archaeology, the scientific importance of his feat should not be underrated. Of course, the fact that he proved that sailing with a balsa raft from Peru to Polynesia was technically possible does not yet prove that Peruvians actually came to Polynesia. The real importance of Heyerdahl's *Kon-Tiki* adventure lies in its bearing upon the much-discussed problem of the feasibility of Polynesian voyages to America and of return voyages to Polynesia.

Roland B. Dixon has shown that the sweet potato and its Quechua name *kumara* were already known in Polynesia in pre-European times. From this he drew the obvious conclusion that Polynesians must have reached the coast of Peru and on their return voyage must have brought back the sweet potato.[1] The validity of this conclusion was questioned by the late James Hornell because he thought that a return voyage to Polynesia would have encountered such difficulties as to make its successful completion appear exceedingly unlikely.[2] Heyerdahl's sailing from Peru to the Tuamotus disposes once and for all of that argument. What can be accomplished with a raft could have been accomplished even more easily with such a superior sailing craft as a Polynesian double canoe or outrigger canoe.

In the light of Heyerdahl's achievement a few Polynesian traditions, which hitherto had received little attention, assume new significance. Thus, a Marquesan tradition speaks of an exploring expedition undertaken by a group of people who sailed eastward in a large double canoe. They are said to have discovered a country, called Tafiti, where some of them remained while the rest returned to their home island.[3] If that newly discovered land was not Easter Island, which is unlikely since the latter is not east, but south-east of the Marquesas, it can only have been South America. Even more striking is an Easter Island tradition recorded by W. J. Thomson. It says that Easter Island was discovered and settled by a group of Polynesians who came from the east in two large canoes. In the eastern country from which they had departed, they had suffered greatly from the heat, and the vegetation there had at certain seasons been completely scorched and dried up by the sun.[4] The description of the climate fits perfectly the coastlands of Peru and northern Chile. There is no incompatibility with other Easter Island tradi-

[1] Dixon (1932); (1934), pp. 173–174.
[2] Hornell (1945), pp. 176–177, 186.
[3] Handy (1930), p. 131.
[4] Thomson (1889), pp. 526–528.

tions according to which the ancestors had come from an island in the west. The story apparently refers to a voyage from some Polynesian island, probably one of the Tuamotus, to the coast of America, and to the settling of Easter Island on the return voyage.[1]

These traditions have been neglected by anthropologists, obviously for no other reason than the alleged impossibility of successful voyages to America and back to Polynesia. It is Heyerdahl's merit to have shown that such voyages were completely feasible. His expedition may therefore mark a turning point in the general appraisal of relations between Polynesia and South America, even though the deductions he has himself drawn from it cannot be endorsed.

Note: Thor Heyerdahl's reply to the points raised in this paper will be published in the next number of the *Journal.—Ed., G.J.*

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[1] This point will be discussed in detail in a paper which I hope to publish in the near future.

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THE ORIGIN OF CONTINENTS AND OCEANS: A SEVENTEENTH CENTURY CONTROVERSY

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STUDENTS OF THE history of science and philosophy are familiar with the stages through which any strikingly novel hypothesis or proposal is likely to pass. At first it is either still-born or peremptorily rejected. Presently it becomes the subject of partizan discussion within a small circle, the majority seeking to justify its rejection. Later comes the stage of more general and relatively unprejudiced discussion. And finally, if it has survived all this, the idea or proposal is quietly accepted and needs no defence. Several generations, perhaps even centuries, may elapse between the first and final stages of such a history, and meanwhile the climate of opinion has changed. Many factors contribute to this change, including for instance, technical or social progress, but among them may usually be reckoned the new idea itself, acting as a hidden ferment even while rejected. And it is for this reason that it is useful to reach far back and examine new hypotheses even while they are still at the stage of entanglement with error and ignorance or superstition. This is the justification for a study of the controversy that arose among English divines and virtuosi during the late seventeenth century concerning the origin of the major surface features of the earth, a controversy centering upon Dr. Thomas Burnet's at first sight far-fetched book, 'Telluris Sacra Theoria,' published in 1680. This work continued to challenge attention far into the eighteenth century, and the date of the sixth complete English edition (with the author's replies to his critics) coincided with that of the birth of one of the founders of modern geology, James Hutton. The last edition appeared in 1759, when Hutton was already thirty-three, while the date of the latter's own 'Theory of Earth' (which borrowed Burnet's title) was 1785.

In 1680, of course, the climate of opinion was dominated by religious beliefs, which for the vast majority in this country meant acceptance of the biblical narrative as in its literal sense inspired. To such people the question of the origin of continents, oceans and mountain chains was one that simply did not arise. The oceans were gathered into their own place and the dry land appeared on the third day of Creation. In Riccioli's massive 'Geographia Reformata' (1661) the subject is not mentioned, while in Varenius' 'Geographia Generalis' (1650), which remained a standard textbook in England for a century, it is only glanced at although attention is paid to the subject of denudation and accretion and the various factors affecting it. Burnet's novel views on the earth's crust may be said to stem from Descartes, whose New Philosophy had been the subject of lively discussion in English University circles during the twenty years following the Restoration. It was Descartes who was the first "world-maker," declared one of the supporters of the orthodox view of Creation, and the Frenchman had indeed shown how the origin and motions of our globe could be explained on mechanical principles. But he covered himself (just as Copernicus or his editor had done

a century earlier) by saying that this explanation was a mere hypothesis and that he retained his belief in the miraculous creation of the Universe. Nevertheless, this Universe had lately been expanding by leaps and bounds, since each improvement of the telescope revealed yet more myriads of fixed stars. And because these were recognized as suns, not only had our own luminary become just one unit of a vast crowd, but our Earth had fallen to the status of just one among many planets. As such it could be much more familiarly handled than heretofore, and, even among the devout, ideas as to other inhabited worlds could be entertained. Fontenelle's witty dialogue on the subject appeared in 1686 and found two English translators by 1688. Dr. Burnet, a pupil of Tillotson, had earlier embraced such speculations and had also rejected the still almost universal view that the material Universe, including all living things, had been created and shaped solely for the benefit of mankind. "And but ask a philosopher," said Fontenelle, "to what purpose there is that prodigious company of fixed stars, when a far less number would perform the service they do us? he answers coldly, they were made to please our sight." Such a theory of causation would of course render unnecessary any search for the why and wherefore of phenomena, yet even among Fellows of the Royal Society only the boldest dissociated themselves from it, although it often took quite ludicrous shapes; as for example that the horse's back was curved and proportioned to take a human rider. Nevertheless the author of the 'Sacred Theory of Earth,' in spite of his unorthodox views, was a man of deep religious convictions. He held that there could be no ultimate conflict between the truths of science and the truths of religion, and that it was undignified and unworthy to invoke the miraculous every time we were faced with what seemed inexplicable. A neo-Platonist, he started from the postulate that the Creator, as the supreme Architect, worked by measure, order, proportion and symmetry. How was this to be reconciled with the contours of the Earth as seen to-day? And particularly with the wild, irregular and terrible shapes of the mountains as they appeared to Burnet when he crossed the Alps and Appennines. The oceans too were (so he thought) hideous and ghastly in their lack of symmetry. There could be but one answer to the problem of such unsightly architecture. The Earth as we saw it to-day was a vast ruin, a mere rubbish heap, which had taken the place of the original shapely globe as it had left the Creator's hands. And we had not far to seek for the catastrophe that had tumbled the world into this ugly confusion—it was the Universal Deluge.

The Flood then was the key point in Burnet's Theory. The antediluvian Earth had possessed a smooth, regular surface, unbroken either by mountain ranges or ocean basins. But when the moment came for the punishment of mankind the crust collapsed (for physical reasons which Burnet explains) along great lines of weakness, thus allowing the "waters of the Abyss" to gush out, and these, combined with the forty days of rain, sufficed to drown all the world to the depth which Holy Scripture records. The basins thus created henceforth contained the oceans. Broken, up-ended blocks formed the rough mountainous surfaces of the now separated continents. Such were the features to be expected when the rigid outer shell of the globe tumbled into the abyss over which it had been arched. Like buildings and bridges thrown down by an earthquake the earth had become a "heap of rubbish," a "rude

lump." The Theorist supposed that the new oceans at first extended up to the foot of the mountains, from which the waters retreated only very slowly as the underground caverns and hollows (which were currently believed to feed all springs and rivers) gradually filled up. This gave time for sedimentation on lowlands of which there were obvious evidences. Based though it was on false premisses, the Theory had a coherence and grandeur which undoubtedly stimulated fresh and deeper thought about the structure of the earth.

The "waters under the earth" mentioned in the biblical narrative had long given rise to difficulties of interpretation, and Burnet boldly equated them with a fluid substratum (corresponding to the modern athenosphere) between the hot and heavy central core of the globe and the outer cooled crust. He was thus adopting, with slight modification, Descartes' concept of the structure of the earth, which he supposed to be that of a cooling fixed star which had been caught up in the sun's vortex. Burnet only hints however at the Cartesian origin of his ideas, and is careful to veil in obscure language his belief that the six "days" of Creation must be interpreted as lengthy stages or periods of time. But he made no secret of the fact that while he accepted the Books of Moses as historical documents recording actual events, he saw no necessity for admitting their literal verbal truth in every detail. Poetry and allegory, he believed, had been freely used in their composition, while the language had been adapted to the experience and understanding of the Israelites to whom Moses addressed himself—mere brickmakers, still smelling of the onions and garlic of Egypt, as one of the Theorist's opponents paraphrases his explanation. He was not alone of course in this viewpoint as regards the Bible. The progress of science had already necessitated the cautious generalization (repeated for example by Robert Hooke) that it was not the purpose of Scripture to teach natural philosophy. But verbal inspiration was still insisted on by most divines.

It is needless to follow the 'Theory of Earth' through all its intricacies. The author had little knowledge of natural science and less of mathematics, so that he fell into many absurdities which gave handles to his critics. But in outline his Theory was arresting, it was presented with persuasive argument, and couched in fine sonorous prose. Consequently it was not only very widely studied, but studied with respect. The consideration of what we should to-day term geophysical and geomorphological problems was not, to be sure, entirely new. Père Mersenne, one of the initiators of those scientific meetings which set the pattern for the Royal Society, had, for example, calculated the volume of water which would be required to drown all the earth to the height of the known mountain tops. And how to remove all this water after the Flood was seen to be perhaps as great a source of embarrassment as how to provide it. The pioneer observational work of Nicholas Steno on rock structure had been translated for English readers in 1671, when Hooke was already pondering the subject of structure on parallel lines, while the riddle presented by the nature and distribution of fossil shells, bones and shark's teeth was crying out for solution. The old, easy assumptions that these were either *lusus naturae* (as Dr. Plot believed) or animal remains left behind by the brief Flood, were increasingly difficult to maintain as the observations of field naturalists multiplied. Dr. Burnet brought all such problems sharply into focus, and clearer thinking was the useful result.

Here a few words must be said about his book itself, which was written in two parts. Of these the first alone, which dealt with earth before and after the Flood, was published in 1680. The second part, in which the manner of the dissolution of the world and the coming of the millennium were discussed was not finished until 1688, and appeared in the following year. Its interest for physical geography and geology is limited to the light it casts on some of Burnet's basic ideas. Under the encouragement of the King, an English version (not a mere translation) of Part I appeared in 1684 and the complete Latin and English two volume editions in 1689. The original Latin volume of 1680 was immediately brought to the notice of the Royal Society by a Fellow, and was summarized by Robert Hooke in 1681 in his *Philosophical Collections* and again by the editor of the *Acta Eruditorum Lipsiae* in the following year, when it was also examined by a German pamphleteer. The first English critic was the aged Bishop of Hereford, in 1685, but meanwhile Hooke had turned up his notes of twenty years earlier, and commenced an important series of lectures and papers on the physical properties of the Earth, some of which were published in his 'Posthumous Works.' They included the direct "Animadversions on Dr. Burnet's Theory" read before the Royal Society in 1689, the same year in which the first really full scale attack on the Theorist was published. This had taken its author several years to compose, and came from a Suffolk rectory. The Rev. Erasmus Warren called his work 'Geologia,' a title which arouses expectations in the modern reader which are not fulfilled. A Greek and Hebrew scholar, his object was to defend the exactness of the Bible story, and the four controversial pamphlets which were subsequently exchanged between the parties revealed merely that neither was well equipped to sustain a scientific argument, although Burnet was the superior in logic. An obvious point of weakness in the theory was the assumption that the antediluvian world had no mountains, for although the circulation of the waters was far from understood (as witness Dr. Plot's pamphlet on the origin of springs) it was a matter of observation that mountains caused clouds to gather and rain to fall, while they were also the sources of rivers. Using the example of dew, Burnet could correctly maintain that mountains were not essential to condensation, but in order to provide for the flow of rivers (which he said would wither away by evaporation as they approached the equator) he had to suppose the general level of the earth to be "higher," or farther from the centre, at the poles. His globe, in fact, was egg-shaped, which he imagined would make his rivers flow equatorward. Newton's 'Principia,' with its arguments for a oblate earth, appeared in 1687 but, while Burnet could correctly point out that the direct evidence for this shape was very slender, both he and his critic Warren made such nonsense of the properties of an egg-shaped globe that a sprightly young Balliol mathematician, John Keill, was able to make both of them appear ridiculous in his 'Examination of the Theory' published in 1698. This book was subsequently prescribed for University reading. But Keill fell back upon miracles as a sufficient explanation of the phenomena which Burnet discussed, so that his work is of no direct interest to the geographer. Equally the criticisms launched by Dr. Matthew Mackaile, George Sinclair, Dr. John Arbuthnot, Archibald Lovell, and John Beaumont were mainly destructive, although they served to keep the subject alive.

Burnet stuck to his guns and, in 1692, in his 'Archaeologia' dealt even more outspokenly (and in terms which must have given pain to the devout) with the absurdities and contradictions which arise if the story of Creation and of our first parents as told in Genesis is taken literally. His last reply to Keill was made in 1699 and he wrote on the Theory no more before his death in 1715.

Meanwhile Hooke had put forward other possible explanations of major changes in the earth's crust. If the globe were shrinking, then mountains would be formed by the wrinkling or folding of the outer crust. Alternatively if the centre of gravity of the globe altered, or its axis of rotation shifted, major transgressions and regressions of the oceans would occur which would explain the distribution of fossils, and account (if need be) for a universal deluge without raising any difficulties about the origin and disposal of the flood waters. Halley during this same period presented to the Royal Society his classic paper (1691) on the relation of evaporation and condensation to river run-off, and his calculations of the distribution of insolation over the globe (1693), while the question of the currents which had been observed flowing in and out of the Mediterranean Sea and their relation to hypotheses of voluminous underground waters was also discussed by the Fellows.

Another country reader of Burnet was the Rev. Thomas Robinson of Ouseby, whose observations of dipping strata in the Cumberland mines led him to formulate a hypothesis (1696) which appears to have passed almost unnoticed; namely, that the continents were what would now be termed geanticlines, and the ocean basins geosynclines. Others who followed where Burnet had led were William Whiston, sometime holder of the Lucasian Chair at Cambridge, whose 'New Theory of Earth' (postulating the catastrophic near approach of a comet) appeared in 1696, and John Woodward, whose 'Essay towards a Natural History of the Earth' (1695) sprang from his observations of fossils, of which he had made a large and carefully classified collection, and his study of erosion, deposition and stratification. Both writers excited opposition and public criticism, but Woodward's views on sedimentation and mountain structure were so reasonably presented that the editors of subsequent English editions of Varenius' 'Geography' added them (together with summaries of Halley's papers) as footnotes. Nehemiah Grew's 'Cosmologia Sacra' (1701), written avowedly to reaffirm the sufficiency of the Bible story, is of no interest to us here but much can be learned about contemporary ways of thinking, and of the progress being made towards a truly scientific temper, from John Ray's 'Physico-Theological Discourses.' In the second edition (1693) of this work he altered its general plan so as to assist those of his friends whose minds were troubled by the new speculations. For it was undoubtedly the case that to depart from the exact letter of the Bible gave colour and encouragement to Atheism, and yet (as Burnet had pointed out) to affirm as revealed truth what science had proved incorrect had the same result. Dr. Richard Bentley's famous Boyle Sermons on the subject of science and unbelief were just being printed. Ray was among the most notable of the new scientific travellers and field-naturalists of the day—his Welsh friend Edward Lloyd, Keeper of the Ashmolean Museum, was another. To his discussion of the Deluge he brings to bear his experience of the great volume of even brief thunder rains, his

observations of the way the little brook at his door could suddenly change to a swollen torrent. But he brings to it also a most careful consideration of the papers read by such men as Halley and Hooke, as well as of the views expressed and the calculations made by leading continental writers. And he had learned the most important lesson necessary to the attainment of truth—to suspend judgment where the data were insufficient. This or that hypothesis might be the more probable, he said, but we could go no further. His botanical excursions ("simpling journeys," he called them) in mountain country had made him much better aware than the Theorist of the part mountains played as the habitat of particular plants and animals, as well as their place in human economy, and he could not envisage a world without them, nor could he deem them unsightly objects, unworthy of the Creator. Indeed, he is among the first to write in praise of mountain landscapes. But he did not fail to notice the immense scale of erosion on their slopes, and pointed out that the end term of the two-fold process of denuding the land surface and depositing the debris in the sea must be the eventual flooding of the waters over the smoothed globe, unless some process of which we were unaware came into play. And although he accepted the evidence for the marine origin of fossils, he was completely puzzled by "those elegant Impressions of the Leaves of Plants upon Cole-slates" which Edward Lloyd had showed him, which could not be similarly explained. "These Figures are more diligently to be observed and considered," he concluded. Ray did not stand alone, but Dr. John Woodward was nevertheless perhaps a little premature when he announced on the first page of his 'Natural History of the Earth' that "All the World is at length convinc'd, that Observations are the only sure Grounds whereon to build a sure and lasting Philosophy." We are apt to confuse our own little world with "all the World," for the Aristotelians were by no means vanquished. And even granting him to be correct, it remains true that mere observation is not enough; there is need for the Thomas Burnets, the minds fertile in hypotheses by which observations may be ranged into order.

And Burnet must forever be remembered and honoured by geographers as the pioneer in the revolt against the dominance of the political map and the political globe which present the world as just a smooth, featureless platform upon which men act their parts. He demanded physical maps, and a physical globe moulded to the actual surface relief and structure. "Nothing would be more useful . . . than a rough Globe of the largest Dimensions, wherein the Channel of the Sea should be really hollow, . . . with all its unequal Depths according to the best Soundings, and the Shores expressed both according to Matter and Form, little Rocks standing where there are Rocks, and Sand and Beaches in the Places where they are found. . . . Then upon the Land should stand all the Ranges of Mountains . . . and the in-land Seas and great Lakes, or rather the Beds they lie in . . . as also the vast Desarts of Sand. . . . And this being done with Care and due Art, would be a true Epitome, or true Model of our Earth"; of that "rude Lump," as he still insisted on calling it. But it took three centuries for his idea to find acceptance, and outside geographical circles the political map devoid of mountains takes precedence still.

VEGETATION PATTERNS IN THE SEMI-DESERT PLAINS OF BRITISH SOMALILAND

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DURING A GEOLOGICAL and water supply investigation carried out in 1947–48, I had occasion to study a large number of air photographs of two areas of semi-desert, the Haud, and the Sawl Haud [2] plains of British Somaliland. Many show ground devoid of appreciable interest, scanty or thick bush growing haphazard and without apparent design, though roads and tracks occasionally show lines of denser vegetation, due no doubt to the delayed run-off in ruts. Other photographs show remarkable rhythmic patterns; "vegetation arcs" as I have called them, at first sight reminiscent of the ripple marks produced by blown sand, but on a large scale; and more rarely "water lanes," one striking multiple example of which resembles a gigantic ploughed field. In some places the patterns are simple, but elsewhere interference effects of the two patterns are to be seen.

Detailed investigation, both of the photographs and in the field, showed that the patterns are not in fact made by sand but by the rhythmical arrangement of concentrations of vegetation—trees, shrubs, herbs and thick grass—which photograph black against the light background of bare desert surface, usually of red sandy soil, silty sand, fine gravel or dried mud. A third type of pattern, "termitaria peppering," of lesser interest and quite different origin, was found to be due to the abundant growth of termite mounds, which show over limestone outcrops on the photographs. This pattern again is made visible by conditioned growth of the vegetation.

The study of the first two patterns, of which I have been able to find no previous recognition, is not conveniently to be pigeon-holed under any one accepted branch of knowledge, and the phenomena are thus awkward to classify. They are manifestly within the province of botany and ecology; the essential background concerns geomorphology and meteorology; the causes, as I believe, must be investigated by physics and mathematics; and the whole matter must be studied on air photographs, since on the ground it proved difficult to recognize the patterns at all. While the superficial deposits are of importance, the underlying solid geology seems to have no particular significance except in its influence in moulding the pre-requisite geomorphology. The synthesis of these factors is perhaps a problem for geographers.

The subject proved to be of more than academic interest when it was found that the vegetation arcs were of considerable help in the water supply investigation. They indicate precisely the direction of the very low slopes; and

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[2] These two names may cause some confusion; their respective locations are shown on the accompanying map. The spelling of the place-names in this paper is in accordance with the R.G.S.II system; Sawl is spelt Sorl on many British maps, and Sol on Italian maps.

serve to define the watersheds in these almost featureless plains and the limits of the catchments of certain *ballehs* (small depressions), important since they form ponds of temporary water after rains. This evidence was particularly useful since detailed ground slopes are not shown on the available maps and are so slight that it is impossible properly to appreciate them without detailed levelling.

The vegetation arcs also appear to have important implications in refuting the allegation of severe soil erosion in these areas, reported by one investigator. The termitaria pattern was found to be a valuable indicator of small limestone outcrops of low relief, scattered like islets in a wide sea of bush-covered alluvium, and otherwise as difficult to find in the field as the proverbial needle in the haystack.

Physical conditions

For a proper understanding of the patterns it is necessary to appreciate the natural conditions obtaining in the two areas. The Haud covers an area of some 119,000 square kilometres (more than nine-tenths the size of England), lying approximately between 7° and 9° 30′ N., and 43° and 48° E., a matter of some 280 by 650 kilometres. Its altitude ranges from 1430 metres on top of the scarp in the Hargeisa area, to about 290 metres at Galkayu in Somalia. Of this great area some 36,000 square kilometres lies within the British Protectorate, extending some 480 kilometres along the southern boundary, and reaching 100 kilometres in depth. To the north and east it is bounded by hill-forming Eocene limestones; the southern and western boundaries, in Somalia and the Ogaden Province of Ethiopia, are topographically indefinite. The Sawl Haud covers an area of some 21,000 square kilometres (the size of Wales), lying between 9° 20′ and 10° 30′ N., and between 47° 30′ and 49° E., about 130 by 160 kilometres, in the eastern part of the Protectorate and across the border into Somalia. Its altitude ranges between about 1370 metres in the north-west, and 915 metres; the main plains lying between 1060 and 915 metres. To the south and east it is bounded by outward facing erosion scarps of middle Eocene limestones and shales, to the north and west by dissected country in the same formation, with some anhydrite.

The terrain of the Haud consists mainly of plains which, to the eye, appear to be flat, though in fact they are very gently rolling and slope slightly to the south-east. The terrain of the Sawl Haud also appears flat though the area is a slightly tilted and extremely shallow saucer with internal drainage centering in the Heman sump, an elongate area some 30 by 7 kilometres, aligned in an east-west direction. It thus differs from the picture conveyed by the published maps.

In the Haud, the strata underlying the more or less thick cover of characteristic red sandy soil, which conceals the solid rocks over wide areas, are believed to be mainly Nubian (Cretaceous) sandstones; but Lower Eocene limestones appear in the north, and Middle Eocene limestones and gypseous shales in the east. In the Sawl Haud there is a central area of Middle Eocene anhydrite (the Haded) which stretches away to the north-west. The anhydrite is usually exposed at the surface, but some Pleistocene pebble beds overlie it in the west and north. The Haded is surrounded, except in the

north-west, by a wide band of Middle Eocene limestone, 25 to 80 kilometres in breadth, in general thinly covered by red sandy soil or other superficial deposits.

The Haud is largely bush-covered, with many species of Acacia and other trees up to a height of 6 to 10 metres, with much scrub and grass. There are also some stretches of grassy plain devoid of bush, called *bans*. The same is true of the Sawl (*sensu stricto*) part of the Sawl Haud, which is underlain by limestone. But the anhydrite plains have only a sparse cover of coarse and rather short tufty grass, being usually barren of trees and with only occasional open scrub.

Both areas, with the exception of the anhydrite Haded, are peppered over

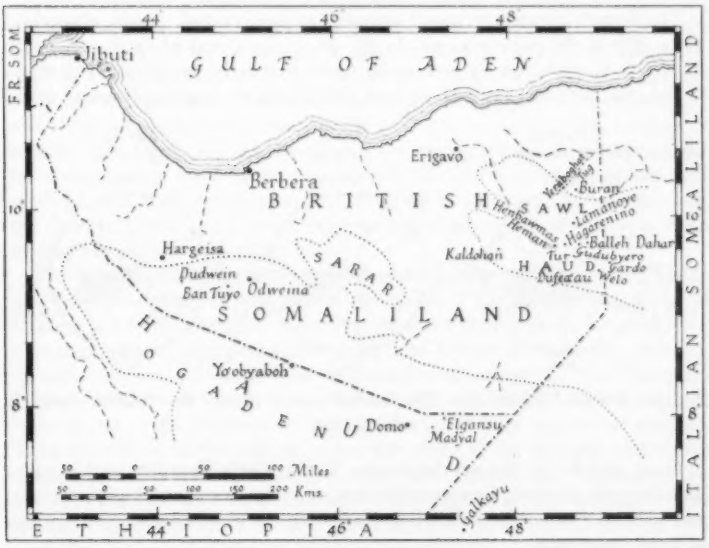

Figure 1

in greater or less degree by "anthills" rising to some 7 metres in height where best developed, the dwellings of termites or "white ants." They are also found on limestone outcrops, and upon the pebble beds or occasional alluvium overlying the anhydrite, but not directly upon that formation.

Judged from four years' rainfall records made by the General Survey of British Somaliland, with longer series from a few stations on the periphery, the rainfall of the Haud ranges from 5 inches (127 millimetres) per year at Galkayu in the south-east to 17 inches (432 millimetres) in the Hargeisa area, with a small area of much higher precipitation, about 30 inches (762 millimetres), along the northern boundary on the scarp east of Hargeisa. In the Sawl Haud the rainfall is little known, there being no stations actually in the area. From those surrounding it the average rainfall appears to be of the

order of 3 to 4 inches (76 to 102 millimetres) per year. In both areas the rain falls mostly in two seasons, the *Gu* rains in April–June, and the *Karan* and *Dhair* rains from September to November, the normal maxima being in May and October (see Fig. 2). Temporary water supplies are available, for limited periods after the patchy rains, in the *ballehs* or ponds which form in natural or artificial depressions. But there is no permanent water over most of the plains. A consequence of the low rainfall, low ground slopes and absorbent surface deposits is the general absence of defined drainage channels in both Haud and Sawl Haud. Records of wind are very scanty, though it is clear that the south-west monsoon blows fairly steadily and often strongly from roughly the end of May until the end of September. The north-east monsoon with calms and gentler breezes then prevails from about October to May.

The Somali nomads occupy these areas to pasture their camels, sheep and goats only in the rainy seasons. In the dry seasons, and when the rains fail, they have to withdraw to permanent water round the periphery. For much of the year therefore both Haud and Sawl Haud are practically uninhabited

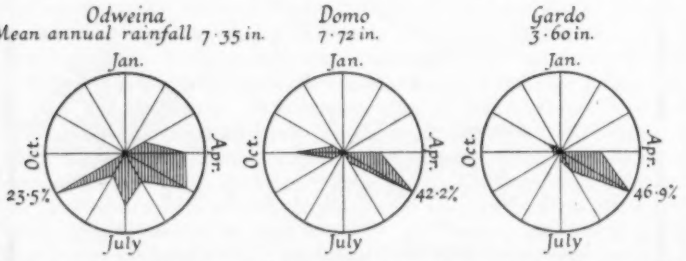

Fig. 2. Rainfall (1944–7). The radial scale shows the relative monthly distribution

by man, and left to the natural fauna. This is fairly abundant and includes lion, leopard, cheetah, hyaena and jackal, many species of antelope, wart-hog, and various smaller animals, birds (including the ostrich) and other groups of small organisms.

The most detailed map is the War Office, G.S.G.S. No. 3937 (1 : 250,000), which is adequate for many purposes, though, owing to lack of survey, the sheets are in some places sketchy and in others inaccurate in the detail shown. The available cover of air photographs is thus all the more valuable, in spite of the extremely scanty ground control. Part of the Haud is covered by R.A.F. vertical photographs taken from 17,000 feet (5180 metres) above sea-level. Both the Haud and Sawl Haud are covered by United States Army Air Force photographs taken from 23,000 feet (7000 metres) on the "Trimetrogon" system, which yields one vertical photograph and obliques to the horizon on either side at each exposure.

Vegetation arcs

Many of the air photographs show patterns recalling the black markings of a tiger skin (Plate 8) or the rhythmic ripples of wind-blown or wave-moved

sand (Plate 1). The Sawl Haud shows these patterns very clearly, and they cover large areas of the Sawl (*sensu stricto*). In the Haud plains they are very well developed in parts of the north and east but are largely lacking elsewhere. Inspection of the photographs shows that the markings, made by the dark tints of the vegetation against the light background of bare desert, are arranged in tiers of arcs which are oriented in clearly defined directions.

A vegetation arc consists of a band of the vegetation that flourishes in the neighbourhood, sometimes mainly thick *dur* grass (*Andropogon cyrtocladus* Stapf) up to about one metre in height; sometimes of a mixed growth of trees, largely *Acacia* species such as *galol* (*A. bussei* Harms.), *qoda* (*A. spirocarpa* Hochst.), *sugsug* (*A. etbaica* Schweinf.), *bil'il* (*A. mellifera* Benth.), bushes and plants of many kinds, and other grasses. Some of the acacias are well-grown trees which may be half a century old. Where the arcs are present, nearly all the vegetation is concentrated in them. The vegetation arcs are clearly marked since the ground on either side is desert practically destitute of vegetation. They are uneven in development, burgeoning here and becoming attenuated there, dying out and succeeding one another *en échelon*. The vegetation is normally densest along the convex, upslope, edge, becoming sparser towards the concave side. Extinct arcs are sometimes (but rarely) found, their position marked by a line of dead trees on bare ground; the bushes, plants, and grass that doubtless accompanied them in their heyday having vanished (Plate 12).

The significance of vegetation arcs is proved by an examination of certain places where defined drainage lines are visible (Plate 4). There is a tier of arcs upslope of the earliest beginnings of the stream course, and the same phenomenon may be repeated downstream of a short drainage line, where it spreads out into a little *doho* or delta and ceases to exist. The important point is that the arcs are invariably oriented so that their chords are at right angles to the direction of drainage, and that they are convex upslope. Thus they very clearly indicate the slight slope of the ground, and so the direction of the drainage, where slope and rainfall are insufficient for defined drainage lines to be formed. They appear in fact to indicate the direction of movement of the sheets of water that flow over the ground after adequate but rare rainstorms, and are specially well developed where conditions might be expected to result in a defined drainage channel (Plates 3, 8, 10). Films or sheets of rainwater of variable depth, up to 25 millimetres or more in the slight depressions but commonly less, have been seen flowing over the ground in the Erigavo district (west of the Sawl Haud) after a heavy downpour. Unfortunately no opportunity occurred of observing this phenomenon among vegetation arcs.

As observed in the field, the ground-level of the arcs is not appreciably raised above that of the strips of intervening desert, and one can drive across them in a motor vehicle with no more hindrance than is imposed by the belt of grass or brushwood. The ground slopes on which they are found have not been accurately determined and, for an approximation, only five suitably located aneroid levels are available, over distances ranging from 3·4 to 9·3 kilometres near Kaldohan and at Dufea'au, both in the southern part of the Sawl Haud, where the arcs are very well developed (Plate 1). These heights

give slopes ranging from 1:340 to 1:460, with an average of about 1:400, which must lie within the range of appropriate slopes.

Fifty measurements, each of a tier of ten arcs, were made on air photographs of the southern part of the Sawl Haud and sixteen on photographs of the Haud. The results are biased in favour of the stronger arcs, since these are easy to measure. An attempt was however made to include weaker tiers, though the smaller and less perfectly developed examples cannot be measured with certainty.

Rhythmic frequency of vegetation arcs

Area	*Transverse width per tier of 10 arcs* (*average*)	(*range*)
Southern part of Sawl Haud		
40 tiers of average development	1·55 km.	1·05–2·10 km.
10 tiers of very strong development	2·13	1·75–2·76
At Ban Tuyo, in the Haud		
10 tiers cut by water lanes	1·69	1·48–2·00
5 tiers of strong development	2·21	1·92–2·28
At Madyal, in the eastern part of the Haud		
1 tier, small, but clearly developed	0·70	—

Thus the rhythmic interval (Fig. 3*a*) of a single sequence of vegetation arc and intervening desert may range upwards from 70 metres or less, but the average is about 158 metres. In the strongly marked arcs the average rhythm was 216 metres and it may rise to 276 metres.

Nine complete rhythms were paced in the field at three localities in the Sawl Haud, at Dufea'au, Gudubyero and Lamanoye. Here the transverse width of the arc usually ranged from 20 to 36 metres (limits 10 to 76 metres) and that of the intervening desert from 70 to 146 metres (limits 25 to 146 metres). From these figures it appears that the transverse width of the intervening desert band is of the order of four times that of the vegetation arc itself. Measurement of the two parts of the rhythm on the air photographs is difficult and unsatisfactory, at least without special apparatus, because of their small dimensions, and errors may be considerable. Attempted measurement with dividers on three tiers, each of five arcs, at Ban Tuyo gave ratios of 1:3·1 (strong arcs); 1:2·3 and 1:3·0 (arcs cut by water lanes).

Combining the above data, it would appear that the average rhythm is of about 160 metres, of which vegetation accounts for 30 to 40 metres, and desert for 130 to 120 metres. Where the arcs are strongly developed the rhythm may rise to some 250 metres (vegetation 50 metres, desert 200 metres). It is clear, both in the field and on the photographs, that there is a considerable range in the transverse width of each part, but even a casual inspection of the photographs shows that the widths normally lie within a limited range of values. Within these limits it seems that the more strongly developed arcs are correlated with the longer rhythms.

The lateral extent of a single unbroken vegetation arc seems to depend upon very local or individual conditions. Where conditions are most favourable

the arcs may measure up to 2 kilometres and more, but they are commonly less, ranging from below 0·5 to about 1·0 kilometre.

The origin of vegetation arcs

In this unusual phenomenon, apparently recognized for the first time, it is difficult to understand the reason for the rhythmic pattern of the vegetation, and the following hypothesis offers only a partial explanation. But the evidence is, I think, sufficient to lift the major cause above the realm of speculation.

After a rainstorm, the water, flowing over this type of terrain as a film or sheet and not in defined drainage lines, carries along with it loose organic matter lying on the surface—seeds, debris of vegetation, and animal excreta (the last is found scattered over the ground in surprising abundance). This

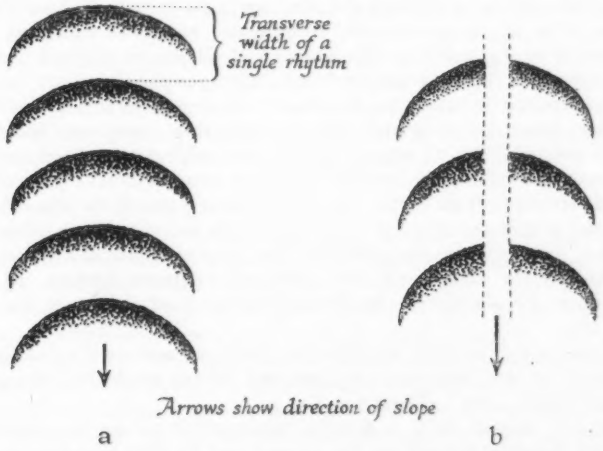

Fig. 3. Diagrammatic (a) A tier of vegetation arcs. (b) Arcs cut by a water lane

load has been deposited in the form of strand lines which have given rise to the vegetation arcs. But they are not ordinary strand lines, such as are commonly seen in this country marking the high water-level of a temporary pool of storm water, and some other reason must be found for their deposition. After discussing the matter with interested friends, the only firm conclusion I have yet reached is that the mechanism is obscure and that further investigation, and possibly experiment, is necessary to elucidate it.

That wind could be the effective agency seems to be out of the question; for it appears impossible that wind could produce a vegetation pattern which foreshadows a drainage system down to the smallest rills (Plate 10); or cause the ringing round of a small depression with arcs concave to the lowest part (Plate 6), or of a low rise (too slight to be called a hill) with arcs convex to the highest part; nor is it likely that it could define a watershed in nearly flat country by a sudden reversal of the curvature of the arcs (Plate 5).

The *kharif*, the south-west monsoon, blows strongly here for nearly half the year in a constant direction, whereas the orientation of the arcs is correlated only with the direction of the slight local ground slope and is independent of the direction of the *kharif*.

The strand lines being deposited and the water flow having ceased, it is probable that a proportion of the concentrated seeds will germinate and produce a small arc of vegetation. Subsequent rain storms at rather rare intervals, perhaps not more than one or two every few years, may be expected to repeat the process with the same rhythm. But once tiers of arcs are established they can act as sieves, and so may cause the enmeshment of more debris of the same nature. Whatever the method, the organic debris of the whole area is concentrated in the arcs and the intervening desert strips are kept bare.

It is difficult, too, to envisage the inception of the pattern. The previously existing state of the countryside is unknown, but some vegetation was presumably present and it is difficult to understand how the rhythmic pattern could have been superimposed on the pre-existing arrangement.

Where crossed by water lanes, the shape of the vegetation arcs is sometimes modified. Some are much more highly convex than usual, even becoming bluntly pointed (Plate 7), suggesting that arcs and water lanes are contemporaneous in origin. Other arcs look as if they were portions of pre-existing normal arcs cut through by the water lanes (Plates 7 and 8), for when closely examined, portions of an individual arc seem to be recognizable on either side of a lane (Fig. 3*b*). It would seem that these arcs were established first and later cut by the water lanes. But interference patterns between the two phenomena are sometimes complex and highly developed, as in the Ban Tuyo area.

Vegetation arcs are best studied where they are most simply and clearly developed, in situations where an increased rainfall would lead to normal incised drainage lines.[1] (Plates 3 and 10.)

The arcs, spaced along a thalweg imperceptible to the eye, look like contours naturally marked on the ground and by their convexity up the slope they indicate a rudimentary trough. Whether this oriented convexity, which seems to be invariable, really indicates a strand line exactly along the contour is a matter for further inquiry. Taking the average ground slope as 1 : 400, and the average rhythm between well marked arcs in such situations as 158 metres, the average vertical interval between them would be about 0·4 metre. In a series of strong arcs, with a rhythm of 250 metres, the vertical interval would be about 0·63 metre. How near to the truth such an estimate (a vertical interval of half a metre) may be, must be left for future research.

That the arcs should be convex upslope is also difficult to explain. With water flowing over a slightly inclined surface on a small scale, such as a road, accumulating debris caught by a point obstruction naturally forms a deposit convex upslope and perhaps an inch or two across. But convexity on the

[1] The evidence seems to indicate that such tiers of arcs normally foreshadow a new, rather than follow an old and silted-up, stream system. That they may form in a silted and derelict valley, as appears in Plate 8, is I think largely fortuitous.

scale found in these vegetation arcs poses a problem on which little can be helpfully said at present.

That the arcs indicate the direction of slope was appreciated when they were first recognized, and the fact was used to produce a rough drainage map of the Sawl Haud before the area was visited. It indicated the existence of an internal drainage area in the neighbourhood of the "well" named Heman on the 1 : 250,000 map. This conclusion was investigated in the field and found to be correct. The Heman proved however to be, not a well, but an area some 30 kilometres by 7 in the anhydrite outcrop, and freely perforated with sink holes [1] which take the drainage.

Vegetation arcs are evidently firm and long established features, for they include lines of well-grown acacias, some estimated as perhaps half a century old. The pattern thus indicates a condition of the semi-desert surface that is stable in existing circumstances. One implication appears to be that no appreciable soil erosion is now taking place in such areas.

Fig. 14 in 'The rape of the earth' [2] is in fact an example of vegetation arc country, erroneously captioned "British Somaliland. Wind erosion," and the authors do not apparently further describe it. The phenomenon has nothing to do with wind and instead of indicating soil erosion in progress at the present time it may be taken as evidence against it.

Water lanes

The phenomena here termed water lanes are again markings defined by the conditioned growth of vegetation. They appear from air photographs as straight tracks fairly clear of bush. They are often multiple and then exhibit a remarkable parallelism which may simulate a gigantic ploughed field (Plate 2) though they do not seem to lie appreciably below the level of the surrounding surface. They are found in country where vegetation arcs occur, and therefore on terrain with a soil cover and the same low slope, and where normal incised drainage lines are lacking. Water lanes cut vegetation arcs at right angles to their chords, which indicates that they run down the maximum slope.

So far these lanes have only been observed on the air photographs and have not been recognized or examined in the field. They are strikingly developed as multiple parallel tracks in few localities, but when the air photographs are carefully examined, what appear to be isolated examples are not seldom recognizable elsewhere among vegetation arcs. They generally arise and terminate among such arcs, but a single lane may continue an incised drainage line (Plate 8), or they may arise from and end in unpatterned bush (Plate 2). In the Elgansu area of the Haud, "stream precursor" vegetation arcs sometimes break down into rudimentary drainage courses, which seem to be of the same nature as water lanes. The dark markings between the two tiers of vegetation arcs upslope of the drainage line seen in Plate 4 also appear to be of the nature of single water lanes. Water lanes thus appear to form an intermediate link between country where the arc pattern is developed and

[1] The Somali word for such a sink hole is *hen*, plural *heman*.

[2] G. V. Jacks and R. O. Whyte, 'The rape of the earth: a world survey of soil erosion,' London, 1939 (fifth impression 1947), p. 96.

country with incised drainage lines, and it may be concluded that they are formed by water flow rather more intense than that which gives rise to the arcs.

The best and largest example of multiple water lanes was found at Ban Tuyo (Plate 2), some 30 kilometres west of Odweina, in the northern part of the Haud. Here the lanes run in a south-easterly direction, but curve slightly and appear to form part of a great arc rather than to be strictly rectilinear. They cover an area about 12 kilometres long and 8 wide, and about sixty parallel lanes can be counted in a cross section. Individual lanes are traceable for 4 kilometres or more before they are replaced by others *en échelon*. The width of a group of ten lanes was measured on the air photographs as 1·65 kilometres; the individual width averaged 81 metres, the lanes and the intervening strips being of comparable width. Another good example was seen 50 kilometres west of Ban Tuyo, at Dudwein (Plate 9). Nearby, a single lane is very greatly enlarged to a width of nearly a kilometre (Plate 8), and cuts through vegetation arcs strongly developed across an old valley in nearly horizontally bedded limestone. This valley was probably cut during the Pleistocene pluvial periods and has since become derelict.

The only well-marked example of multiple water lanes seen in the Sawl Haud was north of Hagarenino, on the north-east edge of the Heman (Plate 7). It covers an area about 6 kilometres long and 6 wide. Individual lanes reach lengths of 3 kilometres or more, though frequently they are shorter and arranged *en échelon*. These lanes are wider than those at Ban Tuyo, ten that were measured giving an average width of 107 metres. The inter-lane widths are also greater, and less regular, ranging from 200 to 400 metres and more. Here the lanes vary in width when traced along their length.

The remarkable features of water lanes in general are their almost exact parallelism (the Ban Tuyo group numbers about sixty individuals), the great width of each separate channel and the lack of any appreciable erosive effect of the water flow. All three characters differ completely from normal stream flow, where the watercourse is narrow and incised and the channel is deflected by the smallest obstacle, rarely showing a straight course over any appreciable distance.

The beach at Berbera on the north coast of British Somaliland consists of a mixture of light quartz sand and heavy reddish black iron oxide and garnet sand; such a mixture of varying density becomes stratified by water movements. In December 1948 parallel drainage lines on a scale of several to an inch were observed to be formed momentarily by a film of water produced by a receding wavelet; they were clearly marked through the upper layer of quartz sand being carried away from the lower iron oxide and garnet sand. This phenomenon, though on a very different scale, may help to explain the formation of parallel water lanes, though it is difficult to understand why the pre-existing vegetation arcs did not cause deflection of the flow.

It is curious that, so far as has been observed in the field or deduced from the air photographs, neither the arcs nor the lanes appear to cause any appreciable alteration in the level of the ground surface, either by addition or erosion. This however requires more precise investigation. A stereoscopic examination of some pairs of the air photographs proved negative, for no details of relief could be observed. The photographs are on a small scale and

I

Vegetation patterns in Somaliland. The plates illustrating this paper are explained in the note at the end of the text, pp. 210–11

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Vegetation patterns in Somaliland (*see pp.* 210–11)

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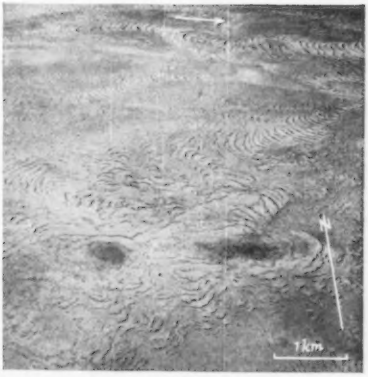

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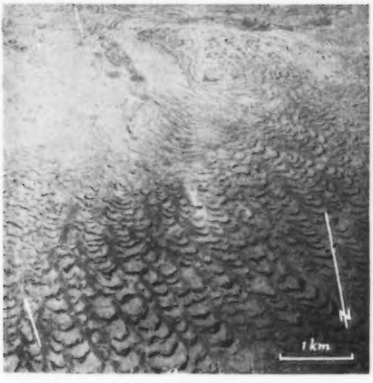

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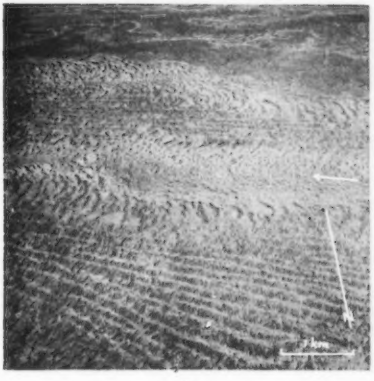

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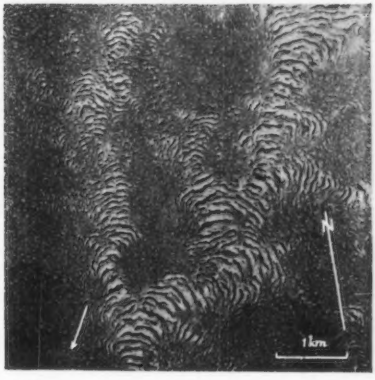

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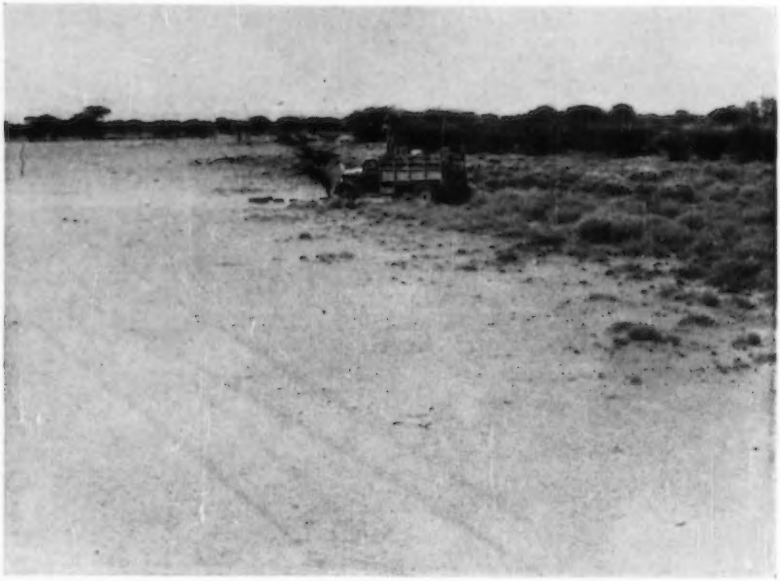
Vegetation patterns in Somaliland (*see pp.* 210–11)



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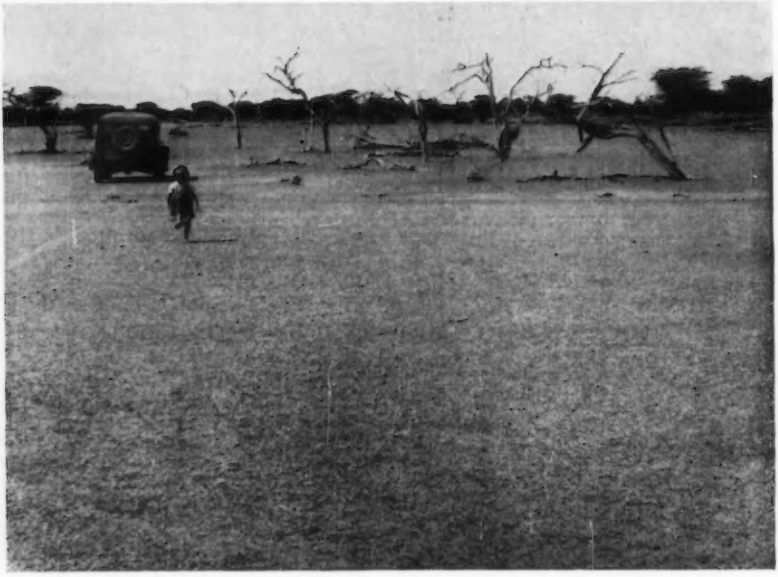

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Vegetation patterns in Somaliland (*see pp.* 210–11)

the differences in level are slight—the only sharp variations being due to the height of the vegetation. Large-scale air photographs might yield more information.

It is impossible at present to do more than call attention to and describe the phenomenon of water lanes, as seen on the air photographs. Any explanation of their formation must be left for further research.

Termitaria peppering

The Haud in particular, and the Sawl Haud to a less extent, are characterized by numerous magnificent red "anthills" which form the most striking feature of the landscape. These are really the structures of termites or "white ants," and here reach heights of up to 7 metres, with a variable base diameter which may reach a couple of metres. Some are tall and slender, others bulky. They vary greatly in their incidence, some places, for example round Yo'obyaboh and Domo, being thickly strewn with large specimens. Elsewhere they may be almost lacking, or found sporadically rising to only one or two metres in height.

In general termitaria do not show strikingly on the air photographs, but on some they form a curious and unmistakable pattern. It is the bare ground round the base that shows, and not the termitaria themselves, which, seen from above, are far too small to be conspicuous or even visible on the present photographs. In the Haud, limestone outcrops are rare and difficult to find in the field, but are sometimes revealed in detailed outline on the air photographs by a prolific peppering of termitaria, which appear as light coloured dots or smudged dots (about 100 were counted to the square kilometre) against a darker background of scattered vegetation. For some reason the termites favour the limestone outcrops, though the termitaria there are of only moderate size. Plate 10 shows a large and clearly indicated limestone outcrop in the north-eastern part of the Haud.

The light coloured and more or less bare ground surrounding the termitaria covers a much larger area on the air photographs than would be expected from a cursory examination in the field. The circular dots must be of the order of 20 metres in diameter, while the smudged dots must be some 40 metres in length. This unexpected feature requires further investigation. It is possible that similar areas of bare ground surround the large and abundant termitaria at Yo'obyaboh and elsewhere, but as these are built on, and of, the typical red sandy soil of the Haud there is no conspicuous light ground to show on the photographs. Flying over the Haud at a sufficiently low altitude, the termitaria were visible as pin points surrounded by bare ground.

In some parts of Africa certain species of termites produce a fertile humus. In my experience of Somaliland the species living there (which I have not had identified) do not, and it appears that the material they use for building is not well suited to the growth of vegetation. In termitaria built on the red Haud soil (not on limestone outcrops), I found that, whereas the soil at the surface and to a depth of perhaps a metre is practically devoid of calcium carbonate, the material of the termitaria effervesces briskly when treated with dilute hydrochloric acid. This suggests that the termites bring up the subsoil which here contains many pellets of *kankar* (secondary limestone), and that this subsoil is unsuitable for plant growth.

In Somaliland the termites do not build upon anhydrite or gypsum outcrops, which are therefore devoid of termitaria. This facilitates geological mapping, the boundaries between anhydrite and limestone being roughly defined by the termitaria, and perceptible from a considerable distance. The termites will however build upon alluvium or pebble beds of slight thickness overlying anhydrite, so that termitaria seen on an anhydrite plain may indicate such superficial deposits.

I have to thank the Authorities of the United States Army Air Force for their permission, given through the Colonial Office, to publish the accompanying air photographs; and Mr. John A. Hunt, Director of the General Survey of British Somaliland, for their loan from the copy of the series in his custody. I must also thank a number of friends, who have a wide range of experience of air photograph interpretation in many parts of the world and to whom the photographs were submitted. All three patterns proved new to them. Since a preliminary note was published in *Nature* (165 (1950) 121) I have heard that Mr. J. W. Wright of the Sudan Survey Department has recognized vegetation arcs on air photographs of the Jebel Qeili area in the Butana plain east of Khartoum; and Professor H. B. Gilliland has informed me that similar arcs appear on air photographs of the Kalahari desert.

Notes on Illustrations

All the air photographs illustrating this paper were taken in March 1945 by 19 Photo Charting Squadron, U.S.A.A.F., at an altitude of 23,000 feet (7000 metres) above sea-level. The obliques face approximately 8° east of north and 8° west of south. The references in brackets are the exposure numbers; the white arrows on the plates show the direction of slope as indicated by the vegetation arcs. The scales on the obliques refer only to the foreground; all the photographs have been reduced by about half.

Plate 1 (283R61): Dufea'au, Sawl Hand, facing south. A general view of vegetation arc country with occasional rudimentary water lanes. The general slope is towards the north, and normally dissected country with a general slope towards the south is seen beyond the watershed boundary cliff.

Plate 2 (314L39): Ban Tuyo, Haud, facing north. In the foreground, multiple water lanes run south-east through much cut-up vegetation arcs; unpatterned bush in the middle distance.

Plate 3 (286R109): Henbawmas, at the eastern end of the Heman, Sawl Haud, facing south. Well developed tiers of vegetation arcs leading to a sink hole (*hen*) in the anhydrite.

Plate 4 (283L62): North of Welo, Sawl Haud, facing north. A sequence of vegetation arcs and water lanes and an incised drainage line.

Plate 5 (294R11): West of Buran, Sawl Haud, facing north. The watershed at the head of the Yeraboghat Tug is marked by the reversal in the direction of the vegetation arcs.

Plate 6 (286L121): Balleh Dahar, Sawl Haud, facing north. Vegetation arcs defining depressions, including a *balleh* and its catchment.

Plate 7 (286R113): Hagarenino, to the east of the Heman, Sawl Haud, facing south. In the foreground, vegetation arcs cut by water lanes.

Plate 8 (314V25): Dudwein, Haud, vertical. A derelict valley now overgrown by strong vegetation arcs which are cut by a very wide water lane.

Plate 9 (314R27): Dudwein, Haud, facing south. A wide drainage area with two series of multiple water lanes; these run east as is shown by the intermingled vegetation arcs.

Plate 10 (356V10): Elgansu, Haud, vertical. Termitaria over a limestone outcrop. The vegetation arcs foreshadow an incised drainage system.

Plate 11: Lamanoye, Sawl Haud. View along the convex edge of a vegetation arc.

Plate 12: Lamanoye, Sawl Haud. A line of dead acacias, the remains of an extinct vegetation arc.

MOTOR TRACKS AND SABAEAN INSCRIPTIONS IN NAJD

H. St.J. B. PHILBY

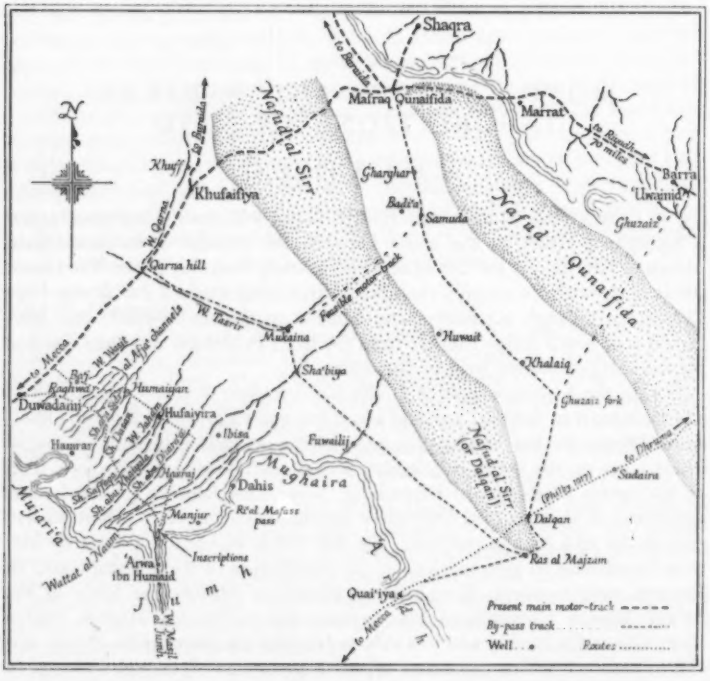
A GLANCE AT the Million map (North G.38) will show a complete topographical blank in the space between the present motor-track from Mecca to Riyadh and the line of my 1917 journey from Riyadh to Taif; more particularly within a roughly rhomboidal area lying inside a line drawn from Duwadami through Khufaifiya and Marrat on the motor-track, and continued southward across country from the latter to Dalqan and Quai'iya, and thence north-westward back to Duwadami.

Within the past nine months I have had occasion to travel over this area and examine it in detail. I was told about two years ago by the king's brother, Amir 'Abdullah ibn 'Abdul-Rahman, of the existence of some Sabaean inscriptions on the rocks at a locality called wadi Masil, rather more than 50 kilometres south-east of Duwadami. Some time later he gave me some specimens of words copied from these inscriptions by an Arab, whom he had sent to the spot for the purpose. The few words and letters copied by him were insufficient to give any idea of the significance of these documents. In January 1950 however, Shaikh Fuad Hamza, a Minister of State in the Sa'udi Arabian Government who is interested in Sabaean studies, paid a short visit to the locality and was able to examine the inscriptions *in situ*; and also to make somewhat inaccurate copies of parts thereof, enough however to show that they were of considerable importance from the epigraphical and historical points of view. Hitherto no Sabaean inscriptions had ever been found in Najd proper, while the only other group of such documents known to us from the interior of Arabia came from Qariyat al Fau, south of wadi Dawasir, where they were discovered by some geologists of the Arabian-American Oil Company and myself in 1948.[1] Qariya was evidently a lonely outpost of Sheban civilization on a caravan route leading to the Persian Gulf coast, where a number of Sabaean inscriptions have also been found.

None of the inscriptions from either of these localities had contributed any material of a historical character; but it was at once clear from the fragmentary copies sent to me by Fuad Hamza that certain Sabaean kings of the early fifth

[1] H. St.. J. B. Philby, "Two notes from central Arabia," *Geogr. J.* 113 (1949) 86–93.

century A.D., already known to us from inscriptions found in the Yaman, had penetrated into central Arabia as far as the Duwadami district. It obviously became necessary to obtain complete and accurate copies of these important documents and in May of this year I broke my journey by car to Riyadh at Duwadami in order to visit wadi Masil. The going across country between these two points was exceedingly rough, as the plain is traversed by numerous wadis descending from the hilly country to the west of Duwadami, which runs south to and beyond Quai'iya in the 'Ardh uplands. The only well



encountered *en route* was that of Raghwa about 12 kilometres from Duwadami, while our general direction was south-eastward across a tract of excellent pasture land, refreshed by the bounteous rains of the past winter and full of grazing camels. Allowing for time taken in geographical observations (compass bearings, etc.), it took us three hours of actual driving to reach the mouth of wadi Masil and the grotto near which are the inscriptions on a basalt cliff on the right bank. About one kilometre up the fairly narrow, rock-bound, valley lies the permanent watering or *ghail* of Masil, while some distance farther up there is a village (which I did not visit for want of time) called 'Arwa ibn Humaid, lying roughly southward of the mouth. Wadi Masil lies within the tribal area of the 'Ataiba.

The grotto is so situated that in summer the sun streams into it soon after noon, so that it can only be occupied in comfort during the morning, though in winter it is probably in shade most of the day. The two main inscriptions (one of ten and the other of nine lines) have been graven in the rather rough basalt rock-face immediately on the north side of the grotto. Inevitably there has been some weathering and flaking off of the rock with consequent damage to the records, but enough of both of them remains to give a good idea of their content. In both the writing is rather crowded into the small spaces available. The longer inscription is at the northern edge of the rock-face, and is easily accessible by a convenient ledge a few feet below it; the other on the contrary, to the right of and well above the first, is quite inaccessible on an overhanging bulge of the rock. The engraver must have used a ladder from below or had himself lowered from above in a builder's cradle. Having no ladder, I had to have recourse to my binoculars to read and copy the inscription: a very laborious process, necessitating the study of two or three letters at a time, and then setting them down on paper. It took me about three hours to copy this inscription, while the other one was relatively easy to copy. In addition to these two important records, there are several minor inscriptions near the bottom of the rock-face, and on loose blocks of rock fallen from above, as well as on a number of blocks on a broad shelf above the cave rock and at the foot of a cliff rising several hundred feet to a peak, which must stand about 800 feet above the level of the valley.

Copies of all these inscriptions have been sent by me to Professor G. Ryckmans of Louvain University for detailed study, and publication in *Le Muséon*. Meanwhile a few words may be said of their general character and content. In the first inscription (Ph. 227) Ab-karib As'ad (As'ad Kamil al Tubba' of the Arab historians) and his son, Hassan Yuhamin (Hassan al Tubba' of the historians) are represented as having built a fort for (or in honour of) the first-named monarch's father, Malik-karib, probably deceased at the time after a reign which covered the last quarter of the fourth century A.D. The inscription may thus be referred to some time between A.D. 400 and 415. Hassan Yuhamin appears here for the first time, so far as the Sabaean inscriptions are concerned, as a king of Sheba with the full title (also enjoyed by his father and grandfather) of *Malik Saba wa dhu-Raidan wa Hadhramaut wa Yamnat wa A'rabhumu Taud wa Tihamat*. Actually in this inscription this long title is shortened in the case of Ab-karib and his son by the omission of the word *humu* (their), and in the case of Malik-karib by the omission of all the words after *Yamnat*. In the fifth line the fort is represented as being built at Masil Jumh, which is still the full name of the place as Jumh is the name of the mountain range through which the wadi flows, while there is a reference in this and the next line to the "district of Maudam" (or Mawadam). This may well have been the original name of Duwadami which, according to local tradition, was however originally called Da'-ward (meaning "the well of sickness" from the fact that the first settlers to occupy the valley died of a local fever) and was afterwards changed to Du'a Admi (Man's desire!). The last few lines of this record are of the usual formal character, referring to certain tribes, tribal chiefs, court officers, and the families and possessions of the kings, etc.

The interesting points about the second inscription (Ph. 228) are that it is precisely dated to the year 631 of the Sabaean era (=A.D. 516), and that it was recorded by a hitherto unknown king (with the full royal title as above) named Ma'd-karib Ya'fur, who must have been the immediate predecessor of the infamous Dhu-Nuas of Najran fame, whose reign ended in A.D. 525 with the Abyssinian conquest of Saba. A personage of the same name occurs in the famous inscription of the Abyssinian viceroy, Abraha, at Marib, dated A.D. 543, but it would seem unlikely that the two names refer to the same person. It may be that the second bearer of this name is to be identified with Ma'd-karib, the son of Sam-yafi' Ashwa who was appointed king by the Abyssinians after the defeat of Dhu-Nuas in 525,[1] while the first Ma'd-karib Ya'fur may be the same person as the Ma'd-karib Yan'im, who appears in my list (*ibid.*, p. 143) as reigning *circa* A.D. 590–510, in which case his reign would have to be extended to 516 at least. The two *cognomina* have certain similarities in the Sabaean script, which might have resulted in *Yan'im* being read for *Ya'fur*, though not *vice versa* as the reading in the present inscription is certain. The only alternative would seem to be to assume that Ma'd-karib Ya'fur was the real name of Dhu-Nuas, who appears to have been known by several different names: Masruq, Zur'at and Yusuf, for instance.

Be that as it may, the fort is referred to as "the fort of Talmahi (?Ptolemy)," while in the next two lines we have mentions of the tribes of Asad, Saba, Himyar and Rahban(?) in connection with a war, as also of Kinda, Tha'labat and Madhar.

So much for the two main inscriptions. In addition there are some sixteen or more minor records, among which the following may be specially mentioned, namely: (i) the name of Ab-karib As'ad (Ph. 229); (ii) a totally illegible inscription of two lines, or perhaps three, in which the only consecutive legible letters give the name of Sam-yafi' above mentioned (Ph. 230); (iii) the names of Yarim dhu-Sukhaim and Yarhab dhu-Su[khaim?], forming items in Ph. 231 (b), in which also occur the names Khauli and Sa'd; (iv) the name of Il-thawab.

I could not find any trace of the fort referred to in the inscription, nor ascertain by inquiry any information about its ruins, if any exist to this day. But not far away is a locality in the 'Ardh uplands called Dahis, famous in the annals of the pre-Islamic tribal wars; and the wadi Masil fort may have been built by the Sabaeans as a military outpost to watch and control the activities of the tribes. The Masil valley must have been a key-point giving access to Najd from the south, as it was well supplied with water for a garrison or patrolling force, while the fort may have been farther up at 'Arwa. The valley debouches into a complex of drainage channels called Wattat al Naum, providing very rich pasture for the Badawin camels and sheep, which can be watered at a number of wells farther out in the plain: al Hasraj, al Ibisa and al Manjur in various channels of Wattat al Naum; Hufaiyira, a considerable Ikhwan village with numerous wells and cultivated fields at the tail of wadi Jaham; Humaiyan with wells in the Afja' valley and the sorry remnants of a still-born Ikhwan settlement of half a dozen miserable ruined mud-huts; and

[1] H. St.J. B. Philby, 'Background of Islam,' Alexandria, 1947, p. 143.

finally the well of Ba'j in Sha'ib Wasit, a short distance downstream of Raghwa. We returned to Duwadami by this somewhat longer, though considerably easier route of about 70 kilometres in order to see and mark down these water-points.

Farther out on the plain, and eastwards of these wells, lie the waterings of Mukaina, Sha'biya and Fuwailij, in that order from north to south, which are available to provide water for cars proceeding on the by-pass route from Duwadami to Dalqan, where there is an important group of wells on the east side of the Nafud sands. Between these and the sands of Nafud Qunaifida runs the route from Dalqan to the take-off point on the Duwadami-Marrat road. This first touches water at the wells of Khalaīq about 35 kilometres north-west of Dalqan; slightly to the west of the car-track about 25 kilometres farther north-west lies the well of Huwait, while the same distance onward in the same direction, and on the road is the important watering of Samuda, nowadays used as the headquarters of the royal stud. Close by is the well of Badi'a, while the last well on the road is Gharghar about 15 kilometres from the existing main road. There is said to be an easy crossing of the Nafud on the general line of Samuda-Mukaina, with an intermediate well on the way, but I did not have an opportunity of investigating its feasibility.

The accompanying sketch-map, which in the absence of all instruments except compass and motor-car speedometer cannot claim to be exact, will show the general disposition of the various localities named in this article. On the east, the line of the sands of Nafud Qunaifida generally runs fairly close to the track, though diverging from it gradually southward of Khalaīq; while the eastern fringe of Nafud al Sirr lies some 15 kilometres due west of the track at Gharghar, gradually converging on it until the two lines meet at Dalqan, a short distance beyond which the Nafud peters out altogether in a firm sandy plain. On the northward leg of the route, the western fringe of the Nafud gradually diverges from the track until at about Sha'biya it is no longer visible and must be at least 20 kilometres distant. To the west of this leg, at some distance though easily visible all the way, lies a solid barrier of mountainous country, comprising the 'Ardh, Mughaira and Jumh ranges, and containing many high peaks and ridges. It is dreary enough country in all conscience, though reasonably propitious to its Badawin inhabitants and their herds and flocks, especially in a season like the present with its bounteous rainfall after six or seven years of relative drought. In general they seem to lead a life of the old traditional pattern, undisturbed by the noisy intrusion of the motor-car and the more distant rumours of fantastic modernization in the great towns like Riyadh. But there is one feature of the Arabian desert, as one knew it of old, which one misses greatly and which has probably gone for ever: the great herds of gazelles which used to roam the steppe and the sand with but little to fear except from an occasional Sulubi hunter, and which have in the last quarter-century of motorized hunting been virtually extinguished, or driven into the more inaccessible parts of the country. A gazelle is indeed a rare sight now on the car-tracks of Arabia; the ostrich has become extinct in the north as it has been for two generations or more in the south; and the oryx has disappeared from the north, though it is still to be found in and about the Empty Quarter.

A LAND USE MAP OF KUNTAUR IN THE GAMBIA

E. GORDON

THE OXFORD UNIVERSITY EXPEDITION to the Gambia in 1948 spent most of its time at Kuntaur (a river port 150 miles up the Gambia river from Bathurst, the capital) where it carried out a land use and soil survey of an area of about 12 square miles.[1] The land use map can make no claim to real accuracy; it aims only at giving a general indication of the pattern of land use in this part of the Gambia. Three geographers were responsible for the survey—C. Swithinbank, E. Gordon and J. Pook. They were helped by an African surveyor and four "boys," so that two parties could be at work simultaneously. The team spent seven weeks of the rainy season in the field. The Africans lost some days through sickness, and two of the geographers were away at Bassé (100 miles upstream from Kuntaur) for a week to make a comparative study. One of the party was usually at headquarters, computing or drawing.

Recent astronomically observed positions were available at Kuntaur, and the main framework was computed from chain and compass traverses with detail from minor traverses. Some plane-table work was done around Wassu; most of Madina's lands were not surveyed. The only published map was one on a scale of 15 miles to 1 inch showing roads, but the R.A.F. air photographs, on the basis of which the Directorate of Colonial Surveys has since produced its 1/50,000 series covering the Gambia, were available. From these photographs were plotted some of the boundaries of the swamps and riverine forest that were inaccessible because of flooding.

The soil map, prepared by R. du Boulay, also gives a very generalized picture of conditions. The types distinguished correspond roughly to the three topographical divisions of the district: the bush-covered edge of the sandstone plateau, rising to about 120 feet; the alluvial flats bordering the river and extending behind Kuntaur and up the tidal creeks; and the area between these two which slopes gently from the plateau edge to the river flats and is the vital area of settlement and of "upland" agriculture. The variety of soil types has an important effect upon settlement because, while most villages stand on the sandy soils that are suitable for ground-nuts, they are usually close to swamps where rice can be easily grown.

Each village, and indeed almost every family, is therefore able to cultivate a cash crop, ground-nuts, in addition to rice and "upland" food crops, such as maize and millet. The Kuntaur district produces large quantities of ground-nuts and is also—unlike many other parts of the Gambia—almost self-sufficient in food crops. Shifting cultivation remains however the basis of its agriculture. The map shows the actual state of the land in a particular season. The areas under cultivation are usually near the settlements or on the clay soils of some of the swamps. The unshaded areas have been cleared and used for cultivation in the past, but in 1948 were lying fallow. There are also the areas, like the riverine forest and the close orchard bush or park savanna of the plateau, which have never been cleared, but which may at some future date be cultivated. The

[1] For a general account see Francis Huxley (the leader of the expedition), "Exploration in Gambia," *Geographical Magazine*, 22 (1949) 271–7.

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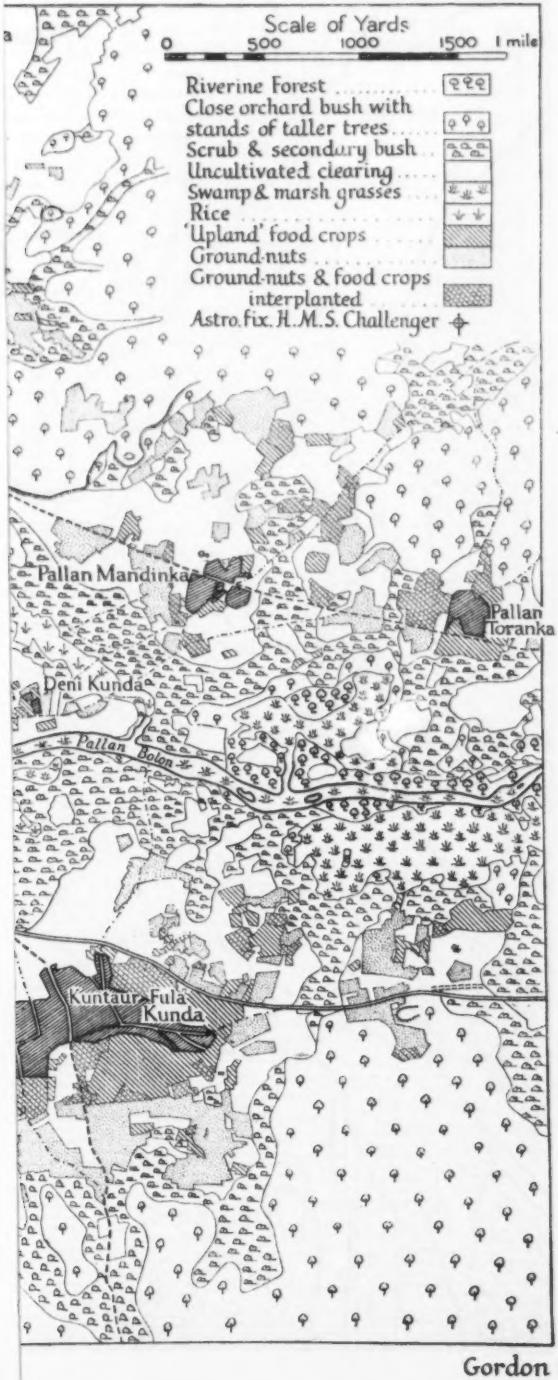

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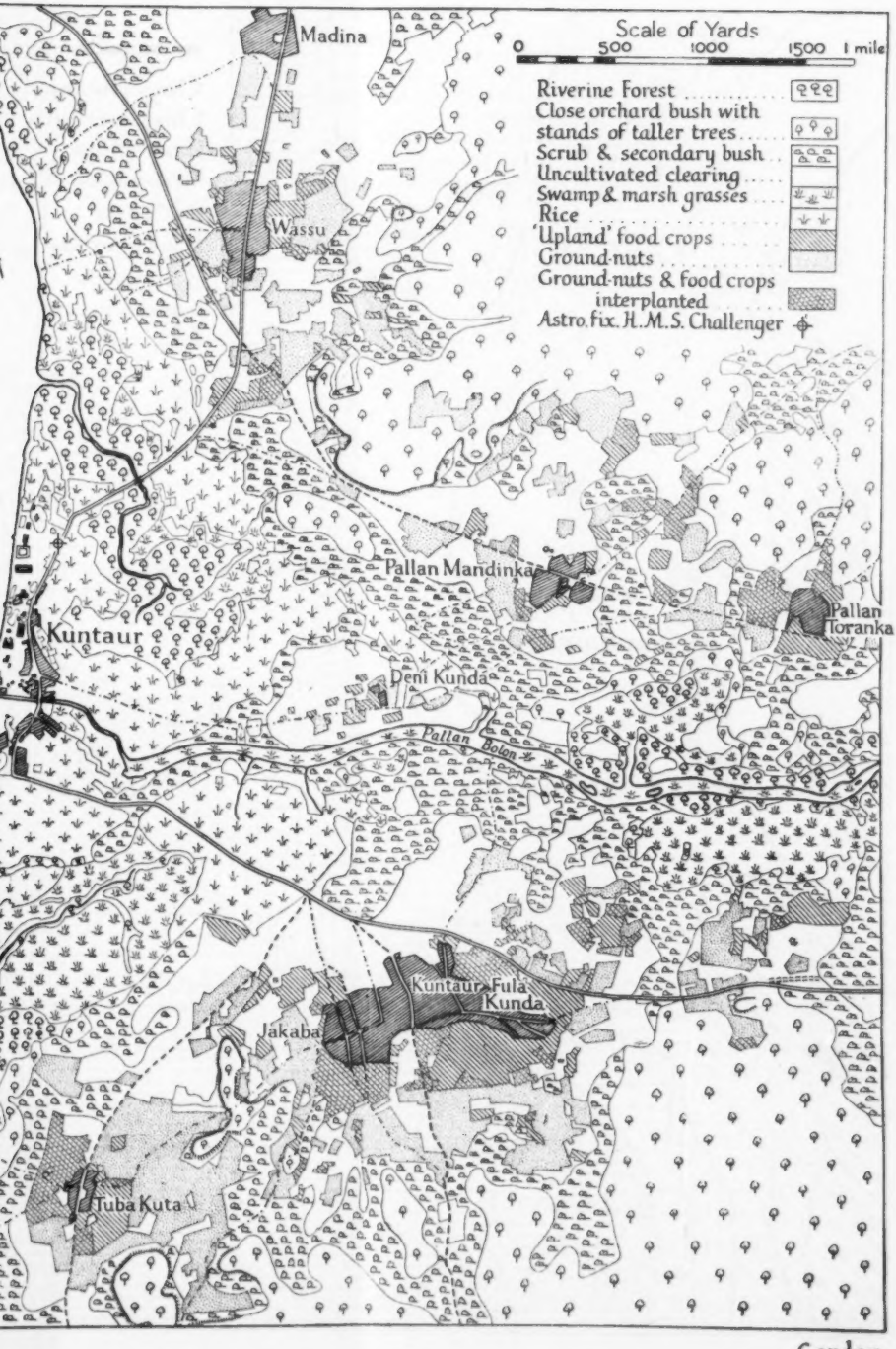

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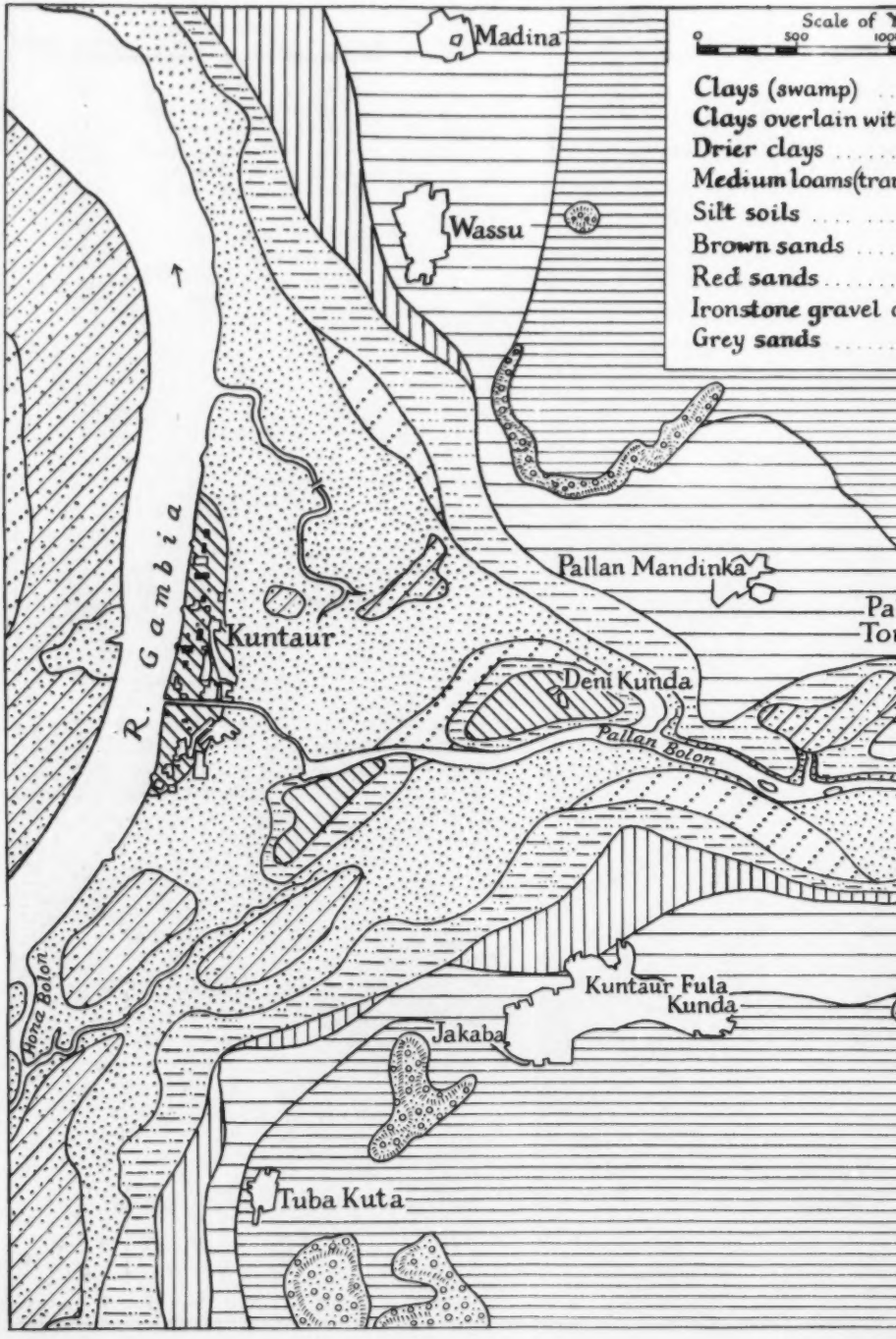
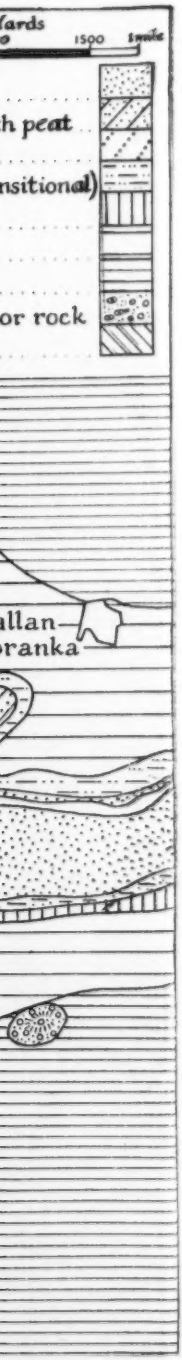
KUNTAUR SOILS

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light soils in the higher parts of the district are soon exhausted and after three or four years' cultivation must revert to grass and scrub for two or three seasons. On the lower lands near the villages the soil is heavier and manure is available, so that shifting cultivation is practised less, though occasional fallowing is still necessary. Only the rice swamps can be farmed every year.

The members of the expedition responsible for the surveys also collected information relating to the composition of the population of the various towns and villages in the area and to the size and ownership of farms, and carried out as detailed an investigation as time permitted of the agricultural methods of the several tribes of the district. Other members of the party studied, at the request of the Government of the Gambia, some of the country's animals, birds and insects, especially those that cause great damage to growing crops. The expedition owed much at every stage to the co-operation and help of many individuals, and particularly of the then Governor of the Gambia, Sir Andrew Wright, K.C.M.G. Generous financial support was given by the Colonial Office, the Government of the Gambia, the Royal Geographical Society and the *Geographical Magazine* Trust Fund, the University of Oxford and several Oxford colleges.

SOME LINEAR EARTHWORKS IN THE DANUBE BASIN

O. G. S. CRAWFORD

DEFENSIVE LINEAR EARTHWORKS indicate lines of friction which have sometimes persisted down to the present day, and thus turn up in regions where the modern field-worker armed with a map might be regarded with grave suspicion. Those about to be described are all near the frontiers of four countries—Hungary, Yugoslavia, Bulgaria and Romania, and it is unlikely that any reader of this journal will have an opportunity of visiting them for many years to come. If he should visit any, he will do a service to archaeology in writing even the briefest account, noting especially two things: the terminal points and the direction faced (*i.e.* on which side of the bank the ditch is). Short of a visit, the ground could be prepared by a clear description of the course, based on the map, and this supplemented by a study of the few published descriptions that may exist. The following notes are a first attempt at supplying the former need.

The maps consulted (at the Royal Geographical Society) were those made before the first war by the Austro-Hungarian government. They are on a scale of 1 : 75,000 and extend over (and beyond) the political limits of the former Austro-Hungarian empire. The area mapped is divided into east–west (horizontal) zones numbered in Arabic numerals from north to south, and into north–south (vertical) columns numbered in Roman numerals from west to east. Each sheet is given a name and also a reference by zone and column, and is bounded by parallels and meridians; but as the latter have Ferro and not Greenwich as their point of origin, only the latitudes marking the north and south limits of the sheets are quoted here.

Yugoslavia

These earthworks were all formerly within the Kingdom of Hungary, but since the First World War have been and still are within Yugoslavia.

The first of these linear earthworks is on the sheet "Apatin und Erdöd" (Zone 23, column xx; Lat. 45° 30′ to 45° 45′) which has the dates 1894 and 23. iv. 1908 printed at the foot. It marks a linear earthwork called Römer Schanze whose north-western terminal point is on the Danube, immediately north-east of the town of Apatin; thence it goes south-east near to, and south of, Priglevica Szent Ivan, through a wood called Szent Ivaner Kameral Wald, to the village of Rac-Militics, north of which it ends at a big lagoon. The total length is 21 kilometres, and the position midway between Belgrade and Budapest.

The second is on the sheet "Neusatz [1] und Peterwardein" (Zone 24, Column xxii; Lat. 45° 15′ to 45° 30′). Its southern terminal point is a lagoon called Neusatzer Ried, immediately north of Neusatz on the Danube. Thence it goes north, passing 800 metres west of the village of Gospodince and ending on the river Theiss between the villages of Bacs (Tisza-) Földvar and Csurog, which latter is at the southern end of a pronounced bend in the river. The total length is 25 kilometres; Neusatz is 120 kilometres north-west of Belgrade.

The third earthwork, called Kleine Römerschanze, begins on the same sheet

[1] Neusatz is now called Novi Sad. This second earthwork is on the direct air-route between Belgrade and Budapest; I saw it from the air in 1938.

as the second and goes north on to the next sheet, "Török-(Uj-) Becse" (Zone 23, Column xxii; Lat. 45° 30′ to 45° 45′). Its southern terminal point is on an old river bed 4·2 kilometres north of Gospodince, thence it runs north to a water-channel called Franzens Canal which it crosses 4 kilometres west of Bacs (Tisza) Földvar. It ends at the river Csik-Völgy at a point 6·5 kilometres west of Bacs-Petrovoszelo on the Theiss. The total length is 30 kilometres, and the southern end is about 120 kilometres north-west-by-north of Belgrade.

The fourth and longest line begins on the sheet "Nemet-Palanka und Kulpin" (Zone 24, Column xxi; Lat. 45° 15′ to 45° 30′), in some marshes north-west of Kulpin on the Franz-Josefs canal. It crosses the railway, and then the second earthwork, north of the village of Jarek. It continues on the next sheet (Neusatz)

Roman earthworks in the Danube basin

and crosses an old river bed 3 kilometres east of Gospodince, curving northwards and running parallel with the second earthwork at a distance of 3 or 4 kilometres. It ends at a point due east of Csurog. An earthen fort (*gradište*) occurs on it at one point. The total length is 45 kilometres.

Besides these four linear earthworks the map marks what it calls Jarčina, and describes as "Römer canal"; it leaves the Save at a point on the left (north) bank about 12 kilometres below Mitrowitz, goes slightly north of east and then curves right round to rejoin the Save in a south-south-easterly direction about 40 kilometres above its junction with the Danube at Belgrade.

Romania

There are two long linear earthworks between the Siebenburgen mountains on the east and the Theiss on the west which run north and south, the first

through the town of Temesvar and the second parallel with it and overlapping it on the east. They are here described from north to south.

The first, which may be called the western or Temesvar dyke, is described as Römer-Schanze, and seems to begin near Szent Anna on sheet "Apatelek und Simánd" (Zone 20, Column xxv; Lat. 46° 15′ to 46° 30′). It continues southwards on to sheet "Lippa" (Zone 21, Column xxv; Lat. 46° to 46° 15′) where there are remains of it east of the village of Szabadhely. From the river Maros southwards it is marked without a break, passing north-west of Allios on to sheet "Rekas" (Zone 22, Column xxv; Lat. 45° 45′ to 46°), and going west of Blumenthal and Fibis through the forest of Oberwald; thence on to the next sheet on the west, "Temesvar und Sandorhaza" (Zone 22, Column xxiv; Lat. 45° 45′ to 46°), through Csernegyhaz and over the Jago Wald to the town of Temesvar. It continues southwards on to sheet "Otelek und Zsebely" (Zone 23, Column xxiv; Lat. 45° 30′ to 45° 45′) and goes parallel to the railway, past the villages of Kissoda, Liget and Folya on to sheet "Detta" (Zone 24, Column xxiv; Lat. 45° 15′ to 45° 30′), and, after passing east of Opatica over the Cameral Wald, it seems to come to an end. The total extent in a straight line is 95 kilometres.

The eastern or Török Szakos dyke begins farther south than the first, overlapping it and running parallel to a point farther south. It starts on the river Valea Sume on sheet "Rekas," at a point north-east of the village of Nemet Bencsek, goes across the Szogasz Wald and passes west of Janova. Then there is a break; it begins again south of the river Bega and west of the village of Bukovec, then passes on to sheet "Buzias" (Zone 23, Column xxv.; Lat. 45° 30′ to 45° 45′), across the river Temes to the village of Török Szakos. There is a gap where it crosses the river Poganis but it begins again immediately to the south, at a point south-east of the village of Roman Sztamora; after turning south-west and passing west of Cserna, it turns south passing west of Sipet on to sheet "Gattaja und Dognacska" (Zone 24, Column xxv; Lat. 45° 15′ to 45° 30′). It goes east of Birda and then turns south-south-east between Kis Semlak and Buttyin. Thence it runs south by west to the river Semnica, crossing it immediately east of the village of German and reaching the river Krivaja immediately west of the village of N. Zsam. Here it appears to end, but it may be continued on the next sheet to the south, "Kudritz und D. Oravica" (Zone 25, Column xxv; Lat. 45° to 45° 15′). The total extent in a straight line is about 74 kilometres.

Besides these two long dykes the map (sheet "Alt Arad und Perjamos": Zone 21, Column xxiv; Lat. 46° to 46° 15′) marks two banks running north and south a little west of Arad, they are unnamed and their character is doubtful.

Bulgaria

Several linear earthworks of considerable extent exist in Bulgaria and are attributed to the Roman or post-Roman period. They are marked on the following sheets of the 1 : 200,000 map also published by the Militargeographisches Institut in Vienna: Adrianopel, Sofia, Pleven (Plevna), Slatina, Svistov, Vidin.

GEOGRAPHY AND "SOCIAL STUDIES" IN SCHOOLS

A memorandum prepared for the Council of the Royal Geographical Society by the Education Committee

The term "social studies" is used nowadays in two senses: to denote a certain advanced discipline at some of our universities, and to indicate a subject recently introduced into the curricula of schools, particularly in Modern Schools and in Training Colleges preparing teachers for them. It is with the latter sense that this memorandum deals. So understood, "social studies" represent an attempt to compress several branches of learning into one. The result is exactly what happens when a lemon is squeezed: the juice is removed, and only the useless rind and fibres remain. The attempt may be attributed, first, to the influence of American theories, which however have since lost ground in the United States and also in Canada; secondly, to the pressure of subjects in school curricula; thirdly, to a new and rather dangerous conception of education; and, fourthly, to the necessity for training teachers quickly. It is felt that "social studies" will destroy the value of geography as an important medium of education, and the Education Committee is concerned at its spread in the schools.

THE PRESENT POSITION

Most teachers of geography in primary and secondary modern schools come from the two-year Training Colleges, where far-reaching changes are taking place in the curriculum. One major change in particular requires careful attention. This is the substitution, in most colleges, of a course in "environmental studies" for the ordinary courses in geography, history, biology, and the physical sciences. The aim is said to be to enrich personal experience and widen the social outlook of the student. The course is usually compulsory for all students: it may last for six or more weeks, or be spread over the whole two years. As a result, the number of teachers-in-training who study geography beyond the stage they reached at school is reduced to the small percentage taking "advanced" geography. There is also the danger that student-teachers may misunderstand the special purpose of this course of "environmental studies" in their own training, and regard it as another "subject" suitable for the primary or secondary modern school.

In fact, under the name of "social studies" this new subject is being increasingly taught in schools, especially secondary modern schools, where it displaces geography and history as separate subjects in the time-table. It is difficult to estimate precisely how far this elimination of geography as an ordered study has proceeded. There is however much evidence of a strong tendency to "break down the barriers between subjects" (an explanation given for the change) and to teach an amorphous hotch-potch of geography, history and "civics" under the heading of "social studies." The content of the courses varies considerably from school to school; most contain a little geography, but in a disjointed and attenuated form, insufficient to preserve the characteristic outlook and discipline of the subject, which in recent years have come to be regarded as indispensable in the education of citizens.

Moreover, in many schools geography, influenced by the new trends, has become largely a superficial study of a series of social and economic topics, to the almost total exclusion of the physical basis. Thus, though still called geography on the time-table, it is scarcely distinguishable from the "social studies" mentioned in the preceding paragraph. There has also been much emphasis on a type of local study, which consists of scraps of social survey leading to an acquaintance with the civic services of local government. Again, it has been an easy step to change the name to "social studies" and to omit aspects of local study that the geographer regards as essential in any school geography course.

These developments are in part due to a new attitude to educational theory and practice which is exercising an increasing influence in the schools. Its adherents regard education as the adjustment of the child to its social environment, and not as the development of the child's individual potentialities within the environment. From this point of view education is a social process, which the child acquires through experience and activities related to the contemporary world. The curriculum therefore ceases to contain separate subjects on traditional lines: these are replaced by "projects" centred on social topics and by "activity methods" of study.

These changes are also related to views on the capabilities of pupils in the secondary modern schools which include 70 to 80 per cent of our children from eleven to fifteen years of age. The Norwood Report characterizes the secondary modern type of child in the following words: "He is interested in things as they are; he finds little attraction in the past or the slow disentanglement of causes or movements. . . . Because he is interested only in the moment he may be incapable of a long series of connected steps; relevance to present concerns is the only way of awakening interest, abstractions mean little to him." Even if this were true of all secondary modern school pupils, and it is certainly not, it points to a more realistic and less academic presentation of geography for some pupils, and not to its submergence in social studies. It must be repeated that if such a submergence occurs, this branch of learning cannot make its characteristic contribution to education.

THE DANGERS OF TEACHING "SOCIAL STUDIES" IN SCHOOLS

These developments must impair the standards of instruction in geography. An attempt to study a group of subjects together introduces such complexity that children cannot see any general pattern or gain a clear and memorable educational experience. The geographer is well aware that knowledge is whole, but makes no apology for dividing it into separate subjects for the purpose of learning. History and geography, for example, are distinct branches of study, and each is recognized as having a unique contribution to make to the intellectual equipment of the educated citizen of to-day. But these contributions are different, and cannot be made unless the recognized content and characteristic method of presentation of each subject are preserved. This is impossible if the two, with others, are merged into a single subject, "social studies."

Local studies are usually stressed in schemes of "social studies." They are undoubtedly an essential part of a good geography course, but local studies in a geographical setting are very different from local studies in a "social studies'" course. In the former setting they are, or should be, related to a larger whole, first the homeland, and then the world, and in these relationships lies their chief value. If the locality is studied in great detail, down to its very trams, rates

and sewers, then the time left for the great countries of the world is likely to be inadequate. Which is more desirable—that a child should know the number and dispositions of all the hospital beds in the borough or that he should have some idea of the broad geographical features of the principal countries of the globe? This is in fact the kind of alternative presented in some schools at the present time. It is not true that a child is ordinarily interested for long periods of time in the myriad details of the life of his own locality. Boredom usually sets in before a full term is out. The strange and unfamiliar can always command his attention and stimulate his imagination. A sound geographical approach continually links aspects of the local area with the geography of more distant lands and imparts a fair and realistic idea of the home country and of the broad natural and human features of the continents. In the study of distant lands it is their geography—that is, their present reality as the home of man—which is essential.

The emphasis placed in "social studies" on human affairs and the complexity of this subject matter lead to a neglect of the natural environment in which man lives. It is the geographer's aim to balance these two aspects, the natural and the human, and an essential contribution of geography to education is the appreciation of the relationship between man and his environment throughout the world. So much damage has already been caused by neglect of this relationship that the omission of this theme from education would be disastrous.

THE PLACE OF GEOGRAPHY IN EDUCATION

The Committee considers that the present unsatisfactory position of geography in the curricula of schools which have adopted the new "social studies" is largely due to failure to understand the nature of geography. A re-statement of its content, suited to the education of the city child, should remove much of the present misunderstanding. Its subject matter—the earth as the home of man—must give it an important place in education.

The geographer, like workers in other fields, draws some of his factual material from other branches of knowledge—the natural sciences on the one hand and the humanities on the other. His primary interest is in the distribution of these data, and he employs his particular technique, map making and map reading, with other visual and verbal methods, to analyse, describe, and relate them. His aim is then to perceive and understand the inter-relationships of these facts. In school this usually becomes a study of man and his activities in the natural environment. The degree to which the complex relationships are studied will be adjusted to the ages, aptitudes, and abilities of the pupils. With senior pupils the emphasis will be on this interrelation, and it is this training which forms the main contribution of geography to education.

Geography is a vital link between the natural sciences and the humanities, and, in fact, brings out the essential unity of these two spheres of knowledge. It is upon this position that its claim to importance is based. Hence, the place of the geographer in the fields of knowledge and education is vital even in schools.

The importance of geography at all levels of education is urged not only by geographers, but by many educationists of standing and experience. "I therefore want you to make the bold claim," said Sir Cyril Norwood, "that geography is an essential part of education whatever forms education may take, and that there can be no question of dropping it in any considered course of study: it is in my opinion more important than a foreign language or a science, highly important

as these are, for the simple reason . . . that the intelligent person must understand something about the world and the country and the district in which he is set to live his life." The steadily increased importance of geography in the grammar schools is reflected by the numbers of those offering the subject in public examinations. Up to the present, "social studies" have not made much headway in these schools, and it is hoped that any pressure in favour of the innovation will be resisted.

The progress of geography in the grammar schools has been paralleled by the increased attention given to it in the Universities, where the number of professorial chairs has increased by eleven since 1939, so that geography now ranks as one of the major advanced studies.

CONCLUSION

The intellectual power and habit of mind afforded by a sound geographical training, with the factual content of the subject, are vital and unique contributions to the educational equipment of future citizens, and cannot be omitted without grave loss to their education. The essentials of a school geography course are:

(*a*) a training in the use of maps;

(*b*) an appreciation of the orderly grouping of significant facts, physical and human, leading to a balanced conception of the neighbourhood and its setting in the home country, and of the major varieties of natural environment and human activity in the world;

(*c*) some understanding of the relation between man's activities and his natural environment.

The organized presentation in school of the significant facts and the gradual emergence of coherent geographical unities are of high educational importance. Upon this basis boys and girls can be trained to be intelligent and enlightened citizens. Social studies alone, even with a geographical bias, can never yield a comparable result.

5 *June* 1950.

REVIEWS

EUROPE

MOUNTAINS AND MOORLANDS. By W. H. PEARSALL. *London: Collins*, 1950. $8\frac{3}{4} \times 6\frac{1}{4}$ *inches;* xv+312 *pages; maps, diagrams and illustrations* (*many in colour*). 21*s*

The New Naturalist series goes from strength to strength and we, the lovers of Britain's natural history, are once more in the debt of the editors and publishers of this series and, in the present instance, to Professor Pearsall for making such a notable addition to the volumes with which we have been stimulated and entertained in the post-war years. Here perhaps is a book which may be found by posterity to be worthy of setting alongside Gilbert White's natural history of a smaller domain.

Professor Pearsall is concerned to give his reader a comprehensive and integrated view of all that distinguishes that "other half of Britain," lying roughly north and west of the diagonal from Devon to Yorkshire, from the gentler, more "English" and more man-impressed region to south and east of that diagonal. He is here an ecologist of the widest possible view, linking the topography, geology, meteorology, pedology, botany, zoology and human geography of those moors and mountains which provide us, mainly town-dwellers, with refreshment, exhilaration and stimulus. And, should the reader of this notice be perturbed by so many "-ographies and -ologies," he may be immediately reassured that the work, while eminently scholarly, carries its learning almost lightly, and ends with a glossary of scientific terms to aid the general reader to whom the book is more particularly directed. Ecology is a rather new science in name but it represents surely that aspect of the natural world which has ever made most appeal to the true natural historian, if by that term we think of the man, yes and child, who goes to nature, seriously yet joyously, for its over-all appeal. Moreover, the ecological or integrated approach becomes increasingly desirable—and perhaps more difficult—as science specializes, necessarily, more and more. Professor Pearsall has carried out that integration in a masterly fashion so that readers of his book should bring to mountain and moorland scenery a new pair of eyes, capable of seeing greater beauty because of the greater intelligent interest which he has aroused.

The reader is first introduced to the structure and geological history of the region considered, then to its climate in relation to height and position, and so to its soils as deriving from the interplay of structure and climate. He is then in a position to follow the author in his treatment of vegetation, insect and animal life and the changes which have occurred in them since the ice sheets receded and, particularly, since man made his impress upon them. The dynamic character of the author's treatment is indeed outstanding—here are no unchanging hills but *παντα ρει*. Since this is, so the author naturally considers the future as well as the past and present and he leaves the reader, and the legislator, with a number of well-posed queries on the changes that our hills might undergo. Some change there must be and man will willy-nilly influence it; what shall it be?

No book perhaps gives complete satisfaction and to the reviewer there was some disappointment that Dartmoor and Exmoor, and the Welsh hills and mountains should receive so little attention compared with those farther north. That however is a quite personal reaction. Less personal I think is the feeling

that the author has sometimes lost his line in a too great wealth of detail or diffuseness of treatment. But we should not really cavil. All concerned are to be saluted—for the illustrations of course, for a magnificent bibliography and index, and a great text. P. A. S.

IRELAND: its physical, historical and economic geography. By T. W. FREEMAN. *London: Methuen*, 1950. $8\frac{1}{2} \times 5$ *inches;* xv+555 *pages; maps, illustrations and diagrams.* £1 12*s* 6*d*

Before the publication of this volume there was no comprehensive geography of Ireland. A pioneer work on the subject is W. Fitzgerald's 'Historical geography of early Ireland' (1925) but it is only a slim monograph with a long and valuable chapter on the island's regions, while G. A. J. Cole's 'Ireland the outpost' (1919) is merely a brief but stimulating essay. All the standard textbooks dealing with the British Isles pay some attention to Ireland but often in a short and summary fashion. Mr. T. W. Freeman has now filled this significant gap with a full-scale treatment of the subject and his book will be an indispensable tool to the student of the geography of the British Isles. While Reader in Geography at Trinity College, Dublin, he made good use of his opportunities to become acquainted with every aspect of Irish problems, and topics of great interest arise on almost every page of his work. The writer of a book on Ireland is at once faced by the lack of specialized geographical articles on which to base his generalizations. Mr. Freeman is well aware of this great handicap and modestly states that "in time the work of the Geography Departments in the two Irish Universities, Dublin and Belfast, should result in a more adequate treatment of the regional geography," than he has been able to give. Meanwhile he has made good this deficiency mainly by his own extensive travels and also by using the work of his students. He did a great deal to develop the activities of the Geographical Society of Ireland and gained much knowledge by directing its annual field weeks. As editor of, and principal contributor to, that Society's journal, *Irish Geography*, he published most of the few specialized geographical articles on Ireland that have appeared in recent years. The fruits of this work have been garnered into the present volume.

Its sub-title proclaims that the book deals with the island's "physical, historical, social and economic geography." It seems unfortunate that the word "regional" is omitted because the last 282 of its 536 pages of text are devoted to a regional geography of Ireland in thirteen chapters and there is no doubt that these regional chapters make a very valuable addition to geographical knowledge. The first ten chapters deal with the special subjects indicated by the subtitle and of these, the pages devoted to population, settlement and agriculture are the most original. Throughout, the author never loses sight of two facts, the significance of the great famine of 1845 on the one hand, and the predominance of agriculture in Irish economy on the other. Mr. Freeman points out that "the clearest claim to uniqueness that Ireland possesses is its population history" and he constantly emphasizes the significance of the reduction of Ireland's population by one-half during the past hundred years. He describes farming as "the key to the country's social geography" and his discussion of the distribution of farms by size and by farming types is especially useful. The urban studies, particularly that of Dublin, are generally admirable but it must be admitted that Belfast deserved fuller treatment.

The book is illustrated by a fine series of maps which call for special commendation, many of them original in conception and most of them drawn by the author; especial praise may be given to the set of maps of population distribution in each region. The references at the ends of the chapters are compre-

hensive and well arranged, but a study of these lists confirms the author's frequently expressed opinion that many Irish problems invite further geographical research. He is careful not to make political judgments, but his descriptions and maps of the distribution of religious communities and of the boundary between the two political units of Ireland will help the reader to understand controversial topics. This well-written book is marked by its sympathetic approach to the Irish people and by a kindly sense of humour. The volume clearly reveals the fundamental differences between Ireland and either England, Wales or Scotland and its author is to be congratulated on making this scholarly contribution to geographical learning. E. W. G.

THE MARITIME HISTORY OF RUSSIA, 848–1948. By MAIRIN MITCHELL. *London: Sidgwick and Jackson*, 1949. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xvi+544 *pages; maps and illustrations.* 31*s* 6*d*

In its origin Muscovy was a land-locked state and the continuity of the vast land area of Russia has always dominated the geographer's conception. Yet some historians have found in the "urge to the sea" one of the principal unifying themes of Russian history, and have underlined the stages by which Russia reached in turn the shores of the White Sea, the Caspian, the Pacific, the Baltic and the Azov and Black seas.

Miss Mitchell is right to draw our attention to this somewhat less evident aspect of Russian history and, starting with the Swedish (Varangian) intruders of the ninth century and ending with contemporary geopolitical considerations, she has swept vigorously through one thousand years. Not that there is much to write about before the period of Peter the Great (*ob.* 1725), although it is not always noted that as early as 1649 Russians had reached the Pacific coast, long before they were established on the Baltic or the Black Seas. Nor perhaps is it generally realized, if we may jump to the end of Miss Mitchell's story, to what extent the Soviet Union improved its maritime position as a result of its 1941–45 war: by its territorial hold, at the expense of Finland and Germany, of the eastern half of the Baltic, by its advance to the Danube delta consequent on the cession of Bessarabia from Romania and, thanks to its profitable six-days' war with Japan, by the re-acquisition of Port Arthur and of the use of Dairen. The development of the canal system of Russia proper and of the short-season northern sea route through Arctic waters now afford some facilities for the unobserved interchange of naval vessels from sea to sea; cruisers and submarines have been moved between the Baltic and the Pacific by way of the Stalin canal and the northern sea-route. What naval vessels, other than the smaller units, can be moved between the Baltic and the Black seas is not clear from Miss Mitchell's account: more detail on canal capacity would have clarified this matter.

This work is an industrious compilation of a great deal of material in several languages, and the bibliography of twenty-six pages should prove useful to the student. The book is over-long and under-critical; nearly one-third of its length is made up of an index of sixty pages, and of appendices and bibliography. The geography is not always what it might be: the Great Plain might have been carried eastwards to the Yenisei, for example, rather than to the Lena river. The illustrations include reproductions of old world maps, old engravings and neat sketches by Mr. Horrabin. There are also numerous citations, some interesting enough. "Where there is a lot of water, there you may expect disaster," so runs a Russian proverb, at variance with one of Peter the Great's beliefs that "the land army has one arm; the Government which possesses an army and a fleet, is a body with two arms." W. G. E.

ECONOMIC GEOGRAPHY OF THE U S.S.R. Edited by S. S. BALZAK, V. S. VASYUTIN and YA. G. FEIGIN. (American Edition edited by CHAUNCY D. HARRIS) *New York: Macmillan*, 1949. $8\frac{1}{2}\times6$ *inches;* xlv+620 *pages; maps and diagrams.* 75*s*

This English version of the Economic Geography of the U.S.S.R. is one of the invaluable series of translations now appearing under the "Russian Translation Project" of the American Council of Learned Societies.

The work was originally published in 1940 and was written at the end of 1939. It therefore "does not take into account the immense changes in the economic geography of the U.S.S.R." occasioned by the war and post-war developments and changes. It has the advantage, nevertheless, as Mr. John Morrison points out in his informative preface, of having been compiled before the draconian Soviet Official Secrets Act of 1947 and is therefore believed to be "the most comprehensive Soviet economic geography for some time to come." There is a welcome fund of geographical information here, though non-Russian readers may be surprised at the tendentious ideological *exposés* and diatribes scattered profusely through this textbook and the tributes to Lenin and Stalin as "the chief philosophical architects" of geographical science (p. x).

The American editors have greatly enhanced the value of the work, especially for English readers, by the addition of a number of handy indexes, useful charts and maps, an index of place-names and short biographical notes on all persons mentioned in the text. There is no general subject index, the detailed table of contents being regarded by the editors as sufficient. This is a pity, but the heaviness of the task for a work of this kind partly justifies the omission. V. C.

ASIA

THE ANTIQUE LAND. By DIANA SHIPTON. *London: Hodder and Stoughton*, 1950. 9×6 *inches;* x+219 *pages; maps and illustrations.* 20*s*

This book is an account of life and travel in Sinkiang and is written pleasantly, often vividly; Mrs. Shipton is the wife of Mr. Eric Shipton who was the British Consul-General in Kashgar. The narrative is agreeable, and does not strive after effect, but describes the anxieties and pleasures of a long stay in an attractive country. It should be remembered that this Chinese province had, just previous to the period written about, passed through a time of revolution and misrule, a change from the easy if haphazard life of the previous fifty years. Yet in spite of recent disturbances the country had altered little, and the authoress and her husband travelled much as they liked, and with little restriction. The tolerance of the Chinese appears evident from the account, and Chinese courtesy and hospitality survived the disturbances that had ravaged the province. The story starts in Kashmir, and the trying journey over the Karakoram mountains is well told. It reminds one that for years this was the only entrance into Central Asia from the south, and indeed to this day the route remains the chief trade route, leading directly to Yarkand the commercial capital of the country.

Those who knew the British Consulate-General in Kashgar will read with delight the account of life there, and recall the welcome and the comfort of the place. What a relief it was to gain that oasis of civilization after the tedious and trying journey from Kashmir.

Mrs. Shipton's remarks on the way in which the British settle down in a country and try to make a home in it, should be read with care. For it is this circumstance that makes the British settlers the welcome residents that they are. The Russians, Chinese and other foreigners in Turkestan were content to live

miserably, in fact to "pig" it, and counted the days till they would be free to leave a land that was merely a place of exile to them. It is this talent for simple comfort that yields so handsome a return. Good work, real knowledge of the country, and sympathy with the people are largely due to this determination to live wisely, for nothing is gained by living in squalor.

Some of the place-names are apt to be confusing. For instance, Kuntigmes on page 174 should be Guntiqmas (the place where the sun does not touch), a common place-name for a shady spot. There is no index and the maps on the end and beginning pages are no better than a rough chart. The book give a live account of what Sinkiang is like, and no one reading it can fail to gain a real idea of what that remote land is. R. C. F. S.

BROKEN THREAD. By Major-General F. S. G. PIGGOTT. *Aldershot: Gale and Polden*, 1950. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xix+424 *pages; maps and illustrations.* 21*s*

Few soldiers or civilians have had such opportunities for probing the Japanese mind and character as the author, and this autobiography records his long and close connection with Japan throughout his career, an association which dated from his early childhood. The thread of Anglo-Japanese relations was spun into a firm bond by the Alliance of 1902 and stood us in good stead during the First World War, but was terminated by us in 1921 when we were confronted with the choice of Japanese or American friendship. In spite of all efforts by the author and other friends of Japan, our ex-ally was gradually drawn into the orbit of German *Weltpolitik* and joined the Anti-Comintern Pact in 1936. For lovers of Japan the dissolution of the Anglo-Japanese Alliance will always be regarded as a tragedy and the student of Anglo-Japanese relations will find this book a mine of information on the subject, but it is perhaps too fully documented with details of the author's personal career. J. H. M-C.

ELEPHANT BILL. By J. H. WILLIAMS. *London: Rupert Hart-Davis*, 1950. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 320 *pages; maps and illustrations.* 18*s*

Here is a really memorable book. The first part describes the author's life between the Wars as a member of that great trading corporation known from King Thibaw's time to the jungle Burmese as the *Bombaing*. Until 1942 it was, whatever it was meant to be, the visible embodiment of the British government in many remote forests from the Kabaw valley and beyond Tamu to the Thaungyin and Siam. Colonel Williams graduated from the care of camels to elephants, and obviously studied them from birth to after death with equal precision and humour and affection, as few men in India outside veterinary circles have done. It is well for us that he has recorded some of that vast forest lore acquired over many years by the "Bombaing" assistants and managers, who were handpicked men and weeded out still more severely by accident and sickness. Clearly too he knew well the jungle Burmese, that courageous, simple and loveable folk, with their almost incredible aptitudes; a knowledge that Secretariats have guessed at too often.

The second part, no less fascinating, is the tale of how the Bombay–Burma Corporation's elephants were saved from the Japanese and of the notable work they accomplished for the Fourteenth Army before and during its recapture of Burma. Not since Kipling has anyone paid this noble and complex beast such a profound and vivid tribute. Colonel Williams has told his tale with humour and modesty and all those who have travelled in the Chindwin and the Assam–Burma watersheds will read much, between the lines, of the difficulties he and those under him had to surmount.

Both the photographs and maps are excellent. The book is a worthy memorial to the part played for so many years by the great timber firms, unseen in the forest depths of Burma. J. K. S.

AMERICA

WEST OF THE ROCKIES. By ERNEST YOUNG. *London: Stanford*, 1949. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xii + 236 *pages; maps, diagrams and illustrations.* 21*s*

This book gives accounts of war-time journeys, mostly by bus or on foot, in the United States west of the Rockies. It is not a textbook and after the first chapter, the geographical setting, it follows the footsteps of missionaries; visits the big trees, famous canyons and national parks; and lingers among cowboys and in some of the cities. The accounts are written in easy and graphic style and give the reader a vivid and clear picture of what is being described. Coming from a distinguished teacher of geography it is not surprising that they provide excellent background material for lessons and lectures. At the same time the accounts are interesting and attractive for the general reader. The value of the book is much enhanced by the generous supply of maps, diagrams and photographs. L. B.

EL VALLE Y LA CUIDAD DE MEXICO EN 1550. By SIGVALD LINNÉ. *Stockholm: Statens Etnografiska Museum* (*New Series, Publication No.* 9), 1948. 12 × 9 *inches;* xv + 220 *pages; maps and illustrations.* £7 10*s*

This work was commissioned and the expenses borne by Dr. J. Holger Graffman as a gesture of international friendship between Sweden and Mexico. The edition is limited and some 600 copies have been presented to learned societies and research workers in the field of Mexican history. The author, Dr. Linné, is Sweden's foremost archaeologist in this field and has therefore brought much learning to bear on the subject matter, namely, the map preserved in the University Library at Uppsala, which is reproduced in coloured facsimile.

To students of cartography the Uppsala map will prove most acceptable. In it we see the influence of Spanish tradition within the framework of a Mexican Indian artistic style. The centre of the map, a plan of the city, is formal, with small elevations of the more important buildings drawn in sepia with great delicacy of line. In the suburbs and surrounding countryside the conventions of Mexican art are preserved and we have a semi-perspective of hills, roads and streams with the population drawn in the midst of their every-day activities. This forms an important clue to the economics of Mexico, thirty years after the Spanish Conquest. It is of interest to note that the map is oriented to the West in accordance with Aztec belief.

Those interested in town-planning will find in the map, and in the very full description in the book, an account of a Renaissance city built from the ground. (The Aztec city of Tenochtitlan had been entirely ruined in the fighting of 1521.) In less than thirty years it was as large as any city in Europe of that date and dignified by many fine buildings and streets. Linné does science a service by reprinting the rare 'Dialogue' of Cervantes de Salazar, which describes a tour of the city of Mexico in 1554.

The general plan of the book is to give the reader a short sketch of the Conquest of Mexico, then to detail the aspect of the City of Mexico at the time of our map, and to compare the map with modern survivals of buildings and also of folk-life. This is followed by a study of the map itself, which shows conclusively that it was painted by a Mexican Indian (with the possibility of a

Spaniard directing the work and perhaps executing some of the city-plan). Many place-names are given in native glyphs as well as in the Spanish alphabet. The dating of the map is between 1536, when the College of Sta. Cruz Tlatelolco was founded, and 1555 when a poor copy of this map was published in the 'Islario General' of Alonso de Santa Cruz, Cartographer to the Emperor Charles V.

The only regret about this work is that it is not yet available in a more numerous edition. It deals with a field of study much neglected on both sides of the Atlantic, the importance of which as a study of the introduction of European culture into the New World is only beginning to be fully understood.

C. A. B.

POLAR REGIONS

TO THE ARCTIC. By JEANNETTE MIRSKY. *London: Wingate,* 1949. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches;* xxii+334+xviii *pages; maps and illustrations.* 21*s*

Many attempts have been made to write a history of Arctic exploration, but none of them has been altogether successful and most of them show a singular lack of objective outlook. The difficulties are admittedly great. The book becomes unwieldy if it includes mention of all expeditions and becomes thrilling only when it stresses failures. The public has little interest in a successful expedition but can never be told enough about a failure. This lamentable state of affairs must of course be born in mind by the publisher in forecasting the sale of the work. Another flaw in Arctic histories is national bias: writers are apt to overlook the deeds of foreign explorers and to underline the work of their own countrymen. Miss Mirsky has largely avoided these pitfalls and her work, on the whole, is a fair assessment of Arctic endeavour of all countries. There are no over-statements and no serious omissions; she arranges her material by ages, motives and areas, with success and failure almost equally stressed, though it is not clear why "Further exploration in Spitsbergen" should be relegated to an appendix. There are long lists of references and a number of useful maps and illustrations. Miss Mirsky has compiled a coherent story from a succession of unrelated expeditions and has shown the gradual development of knowledge. The book, which has a preface by V. Stefansson, is a welcome addition to Polar literature. An earler and much inferior edition published in 1934 was called 'To the North.'

R. N. R. B.

GENERAL

NEW WORLDS EMERGING. By E. P. HANSON. *London: Victor Gollancz* 1950. $5\frac{1}{2} \times 8\frac{3}{4}$ *inches;* xix+385 *pages.* 16*s*

Refreshing and stimulating, yes; convincing . . . well, sometimes. It is avowedly a counterblast to "Neo-Malthusian Jeremiahs" such as Vogt, and does perhaps establish that such a counter-attack is possible. But in itself it has too much the air of Chamber of Commerce publicity and too little solid analysis; significantly there is no documentation. It is just not good enough to tell us (p. 85) that "statistics indicate that Queensland is to-day Australia's most healthful region" with not a word on the qualifications (selected population, tendency to retire to Victoria to die . . .) given by Grenfell Price, who seems to be the source. Mr. Hanson has much that is true to say, and says it with point: "it is never a land which is over-populated, in terms of inhabitants per square mile; it is always an economy, in terms of inhabitants per square meal." (p. 14); the

pioneer can clear forest and grow crops but "without help, it is usually impossible for him to get over the hump that stands between subsistence and economic growth," (p. 129).

Mr. Hanson has the usual American attitude to "colonialism" with the less usual merit of seeing the faults of his own country and the achievements of others in this respect. He pins his faith on technical aid carried out in a Rotarian spirit: altruism and profits, in fact "Service." He is right in asserting that often it is the economic and social climate rather than the physical that keeps "backward" countries back. But his belief in the essential reasonableness of Big Business as a whole (despite the malpractices of this corporation and that) seems a little naive; nor, though he is aware of the limitations of progress on paper and in constitutions, is he very realistic in his attitude to political problems Wisely, he omits Asia altogether; yet here his dictum about overpopulation is more than doubtful, and Asia is crucial to the whole problem of man and food.

But this is a book of goodwill; it is perhaps a recommendation that Marxists will see a new and subtler imperialism in his proposals, devotees of free enterprise merely more state squandering. Mr. Hanson is advocate rather than judge; but his brief is attractive and presented with engaging breeziness, and it contains some facts and arguments that merit careful attention. It is a pity that the case is weakened by confused thinking and loose asseveration.

O. H. K. S.

A GERMAN AND ENGLISH GLOSSARY OF GEOGRAPHICAL Terms. By ERIC FISCHER and FRANCIS E. ELLIOTT. *New York: American Geographical Society* (*Library Series No.* 5), 1950. 8×5½ *inches;* vii+111 *pages.* $3

The standard German-English dictionary in use in England is an edition of 1908, reprinted with an appendix in 1931 and reissued (in the United States) in 1946. The German language has undergone considerable change since 1908. The American Geographical Society's German glossary can be recommended without reserve to those who have to read the geographical German written during the last thirty years, as an authoritative technical supplement to available dictionaries. English users will still have to find out for themselves the English for Americanisms like "clapboard house," and they will have to allow for the difference between English and American usage when they encounter such English-looking terms as spate, swale and strath. It is fair to tell American users that the German *Kessel* has an exact English equivalent in "(glacial) kettle," and that the German *Schrebergarten* has a simple equivalent in "allotment." Plain errors are few; *waldlos* is better rendered by "unforested" than by "treeless," and a *Rotations-ellipsoid* may surely be either prolate or oblate. A few terms, like *Rumpfscholle, Quellfluss, Taldichte* and *Talweg* have not been happily rendered. The glossary was evidently compiled with more regard for German geography than for the geography of Germany; but the principal source of German topographical terms is the map of Germany, just as topography is the foundation of geography. Comparison of this glossary with one prepared for British Service use suggests that the inclusion in the former of the names of all features, natural or cultural, which appear on German maps, would enhance its value. Words like *ponor,* too, which are only conventionally German, might be so marked. The glossary reveals the Nazi mind very clearly through such entries as those under *Raum-* and *Volk-*. From the English-German section one can learn the German for such things as "bad lands."

M. A.

CHAMBERS'S ENCYCLOPAEDIA. New edition. *London: George Newnes,* 1950. $10\frac{3}{4} \times 7\frac{1}{2}$ *inches;* 15 *volumes; maps and illustrations.*

This edition of Chambers's Encyclopaedia is for all practical purposes a new work, and it can claim to be the first new reference work of this type to have been produced in this country for a number of years. The allotment of space to particular subjects and the method of presentation have been re-considered afresh, and the text accordingly largely re-written and extended by half as much again. To have planned this work in the difficult years since 1944, and to have carried it through, reflects great credit on the managing editor Mrs. M. D. Laws and her staff, as does its production upon Messrs. George Newnes, who publish this edition by arrangement with Messrs. W. and R. Chambers. A special feature is the format of the volumes, which are of convenient dimensions, and light to handle. They are illustrated with numerous plates (some in colour), diagrams and maps in line—in addition to those in the Atlas volume. Some of the sketch maps have however been too heavily reduced to be of much value. The work is stated to be designed for the "educated layman" with a general grounding in some subjects who is anxious to proceed further; except in articles on recent scientific advances, therefore the treatment is not highly technical. As the Editor remarks, there are arguments in favour of a systematic arrangement of the matter with each volume given to a particular branch of knowledge and, though the traditional alphabetical arrangement has been retained, much has been done to overcome excessive fragmentation. The number of entries, particularly of the gazetteer type, has been reduced considerably, and comprehensive articles of moderate length have been introduced so that a more coordinated view of a subject can be obtained. To this end the classified list of articles also contributes.

Professor A. Austin Miller was the advisory editor for geography, and most university departments of geography in the British Isles are represented among the contributors. The editor and Professor E. G. R. Taylor contribute an excellent and concise summary of the history and present status of geography. (Too concise, geographers may consider, when comparing the five pages allotted to this topic with, for example, the thirty-six pages given to historiography, history and the philosophy of history.) Physical geography is dealt with under some eighty entries, ranging from "Alp" to "Wold," and similarly, but less extensively, meteorology, oceanography and cartography. "Peneplain" and "Microclimatology" thus appear, probably for the first time, as headings in an encyclopaedia: one omission is "meander," which is only referred to incidentally. The articles on regional geography are written on a uniform plan as far as possible and are based mainly on political divisions. Entries such as Central Massif, and Central Russian Uplands are however used, though these are perhaps not forms which would readily occur to a reader. The entries under the larger units contain adequate summaries of the physical geography and geology, human factors, anthropology and archaeology. The topic of exploration is dealt with under that heading, and gains from this treatment, though it is approached rigidly from a European point of view.

Apart from conveying these comprehensive summaries of knowledge, the Encyclopaedia gives answers to questions of the type continually being addressed to librarians; on the constituents of the Home Counties, for example, or whether Monmouthshire is part of England, though necessarily they may not always be as definite as the inquirers expect.

The task of producing this work must in its own way have exceeded that of the editor of the original issue, who from 1859 to 1868 saw 520 weekly parts through the press.

BRITANNICA BOOK OF THE YEAR, 1950. *London: Encyclopaedia Britannica Ltd.*, 1950. 11×8½ *inches;* xvi+718 *pages; maps, diagrams and illustrations.* £2 10*s*

In rapidly changing times the periodical review of public affairs becomes an indispensable work of reference. The *Encyclopaedia Britannica* has been issuing "books of the year" regularly since 1938, as supplements to its fourteenth edition of 1929. That for 1950 is the first to appear in Times Roman type. The general text is in 9 point type on a 10 point body and is perceptibly more legible than the subordinate information printed in 7 point. As a register of change the volume should prove as least as useful to the geographer as the statistical year-books he has to consult, for it gives fuller information on many things and seems remarkably up to date. In general plan, articles consist of an explanatory paragraph followed by an analysis of the year's change in the subject. This, in technical subjects, means that the statement is addressed to the student, and the layman must go to the *Encyclopaedia* itself if he wants things explained.

The voice of propaganda is rarely heard from the authors of this work. The reviewer would like to know more than is told about Macedonians before being offered a map of a unified Macedonia, but its presentation is interesting and quite inoffensive. The tabular statements of the organization of modern states and their dependencies are very welcome to geography, and the particulars in smaller type which follow the articles on countries and commodities display an enormous amount of useful quantitative information. Some parts of the world are treated under regional rather than political geographical grouping, which is not always an advantage. The map of the Republic of Indonesia would be more useful with the article on Indonesia than with that on Netherlands Overseas Territories. And articles on subjects which have not before been treated either in the *Encyclopaedia* or in the book of the year might well be indicated, say, by an asterisk. An encyclopaedia naturally contains a high proportion of geographical information. About five hundred authors of the 1950 book of the year are listed, of whom only four are described as professional geographers. The geographical information has been supplied mainly by linguists, historians, economists, engineers, administrators and various kinds of publicists; but to see how well the geographers themselves can do it, one has only to turn to the article on Korea.

M. A.

THE SOCIETY'S NEWS

APPLICATIONS FOR GRANTS FOR EXPLORATION AND RESEARCH, 1951

Applications should reach the Director not later than 1 March 1951. Candidates should state (*a*) their scheme of research or scientific programme (*b*) names, numbers and qualifications of members (*c*) length of time in the field (*d*) total estimated cost (*e*) names of other institutions to which they have applied for help (*f*) the amount of the grant, and any other assistance, that they request. All applications should be accompanied by two letters from qualified institutions or individuals supporting the proposed expedition or research. Leaders of expeditions and applicants for grants will be expected to attend an interviewing board. All applications must be typed.

GRANTS IN AID TO EXPEDITIONS, 1950

The following grants for geographical exploration and research were approved this year by the Council of the Society: £50 to the Durham University Exploration Club (Iceland); £100 to H. W. Tilman's expedition to Anapurna Himal (Central Nepal); £50 to J. Warren Wilson's expedition to Jan Mayen Island; £100 to the Oxford University Exploration Club (Central Persia); £100 to R. W. Marsh's expedition (Northern Karakoram); £100 to R. G. Goodchild's expedition (Cyrenaica); and £100 to Wilfred Thesiger (Northern Oman).

Of the above, £250 was derived from the *Geographical Magazine* Trust Fund towards the grants to the expeditions to Central Nepal (£50), Central Persia (£50), Northern Karakoram (£75) and Cyrenaica (£75).

THE NORWEGIAN–BRITISH–SWEDISH ANTARCTIC EXPEDITION

During the summer, the R.G.S. has once again been the collecting centre for equipment of all kinds for the Queen Maud Land Expedition whose relief ship *Norsel* sailed once again from Oslo in the middle of November for Capetown and the Antarctic. On board, for the Antarctic summer voyage, are Professor H. U. Sverdrup, Director of the Norwegian Polar Institute, who has been chiefly responsible in Oslo for the general administration of the Expedition; Dr. Brian Roberts, Research Fellow of the Scott Polar Institute at Cambridge and a member of the Society's Joint Polar Committee; and Lieutenant N. R. R. Foster, R.N., a navigation specialist. These however will return with *Norsel* next spring. In addition, there will be J. E. Jelbart, physicist, from the University of Melbourne, who will make the sixteenth member of the wintering party and will remain in Queen Maud Land until the expedition returns in 1952. Mr. Jelbart will assist the Swedish glaciologist and deputy leader, Walther Schytt, and his colleagues G. de Q. Robin and Charles Swithinbank, in carrying out the extensive glaciological programme which is one of the main features of the expedition's work. With Jelbart's arrival, the Australian element in the British party will increase to two, for G. de Q. Robin is another Melbourne graduate. The original British wintering party of four will now increase to six, for it also includes Leslie Quar, seconded from the R.A.F., as assistant radio operator. By the time these paragraphs are in print the sledging programme, already forecast in the bulletins and articles published periodically in *The Times*, will be in full swing and this first international expedition to Antarctica, the most ambitious venture in exploration with which the Society has been connected for many years, will have embarked on its second season's work.

A highlight of the expedition's first winter was a message from Her Royal Highness Princess Elizabeth who read in one of Captain Giaever's reports to *The Times* of the celebrations, led by the British party at Maudheim, on the news of the birth of Princess Anne. Her Royal Highness sent the following message to Captain Giaever, as leader of the Expedition:

"I read your report of 7th September with great interest and was very pleased to learn that the birth of my daughter was the occasion for a celebration by your party in Queen Maud Land. I send you my best wishes for the success of your expedition. ELIZABETH"

In reply, Captain Giaever sent the following message:

"May we offer Your Royal Highness our sincere thanks for the message and good wishes sent us. We greatly appreciate the honour of the interest shown the expedition by Your Royal Highness. JOHN GIAEVER"

THE INTERNATIONAL GEOGRAPHICAL UNION

The Executive Committee of the Union met in London from August 28 to 30 at the rooms of the Royal Society. The meetings were attended by Professor Cressey (President) and Dr. Kimble (Secretary) from the United States; and by Professor M. A. Lefèvre (Belgium), Professor R. Almagià (Italy), Professor H. Boesch (Switzerland), Professor G. H. Kuriyan (India), Professor O. Ribeiro (Portugal), and by Professor Dudley Stamp (Great Britain). A joint meeting was held with the British National Committee for Geography, under the chairmanship of Brigadier R. Bagnold, F.R.S., at which Dr. Wallace Atwood, Chairman of the American National Committee, outlined plans for the next International Congress in Washington in August 1952. Dr. Atwood stressed the strenuous efforts being made in the United States to reduce costs and overcome the dollar barrier so that as many delegates as possible, especially from non-official institutions, might be able to attend.

Hospitality was provided by the Royal Society and a reception was given at the Royal Geographical Society so that the past and present Councils might meet the Executive Committee. A feature of the meetings and the reception was the presence of the distinguished French geographer, Professor E. de Martonne, Honorary President for life of the I.G.U., and Madame de Martonne.

THE SOCIETY'S STUDENTSHIP IN CARTOGRAPHY

The Society has established a studentship in the history of cartography from the bequests of Sir George Fordham and Mr. Michael Andrews. The studentship, which is tenable for one year in the first instance, has been awarded to Miss M. E. Harvey. Miss Harvey won an open scholarship to University College, Exeter, and obtained a London external degree with first-class Honours in Geography. After preliminary work on general medieval cartography, under the guidance of the Society's Librarian and Mr. R. A. Skelton, Superintendent of Maps at the British Museum, she will work on the British contribution to the inventory of early maps (1200–1500 A.D.) which has been undertaken by the Commission for the Bibliography of Early Maps set up by the International Geographical Union.

REPAIRS AND REORGANIZATION IN THE SOCIETY'S HOUSE

Extensive repairs have been carried out in the Society's House during the summer, some as the result of war damage, others equally urgent but held up by the war and the immediate post-war delays in obtaining licences and materials. The Map Room in the Old Building has been entirely redecorated with cream

walls which have greatly improved the lighting of the room. Next door, and almost opposite the main entrance for Fellows on the ground floor, the Reception Room has been redecorated in the same colour scheme and next spring will be converted into the Fellows' Tea Room, the small room to the west—called the Photograph Room—being converted into a kitchen. This will greatly help the service of teas, both as regards space for an increasing number of Fellows and ease of service. Moreover, direct access from the Reception Room to the Garden will enable teas to be served in the Garden during the summer.

A new photograph and slide room has been organized in the sub-basement The Library has also been redecorated and the new decorations show off to perfection Kennedy's elegant design which, to judge from the continued requests from architectural students to photograph and draw the Library, has made our Library a classic of modern library architecture.

GEOGRAPHICAL CONGRESS IN CAIRO

Ceremonies will be held in Cairo from 27 December 1950 to 3 January 1951 to celebrate the seventy-fifth anniversary of the Royal Geographical Society of Egypt, the twenty-fifth anniversary of the foundation of the Fouad I University and the inauguration of the Fouad I Desert Institute. The Director and Secretary of the Society will represent the President at these official ceremonies which will also be attended by Brigadier R. A. Bagnold, F.R.S., member of the Council and of the Society's Research and Expeditions Committee.

THE PRESIDENT'S APPEAL

The President and Council most gratefully acknowledge the following contributions to the fund for the promotion of exploration and other activities of the Society, for which an appeal by the President was circulated to Fellows with the March issue of the *Journal*: G. C. Schluter, £105; I. D. Margary, £100; P. Vaughan Morgan, £100; Mrs. Prendergast, £100; Henry G. Ferguson, £35 11*s*; Lady Claud Hamilton, £10; Carl T. Keller, £8 16*s* 10*d*; Sir Herbert Cohen, £5; Paul E. Vernon, £1 15*s*; The Rev. Gregory Hopper, £1 1*s*.

THE RECORD

SCHOLARSHIPS IN GEOGRAPHY AT OXFORD

Jesus and Hertford Colleges and St. Edmund Hall will hold a joint examination on 13 March 1951 and following days for the purpose of making awards in Geography. At Jesus College one or more awards (Scholarships or Exhibitions) may be made for Geography. At Hertford College one open MacBride Scholarship of £60 and at St. Edmund Hall one Scholarship of £40 are offered for Geography. The examination will consist of an English Essay; a General Paper; a paper in translation from at least two of the languages, Latin, French, German; and three papers in Geography. The Scholarship at Hertford College is only offered in every third year and 1951 will be the first occasion on which the three colleges named have offered scholarships in Geography at the same examination. Full details about these scholarships can be obtained in the *Oxford University Gazette* of 28 June 1950 which gives a complete list of all scholarships to be offered by men's colleges at Oxford in 1950–51.

RUSSIAN PLANS FOR IRRIGATION IN CENTRAL ASIA

Recent official pronouncements from the U.S.S.R. lay great emphasis on a decree of the Council of Ministers for the construction of the Turkmenian canal and a dam at Takhya Tash on the Amu Darya—the Oxus of the ancients. The hill of Takhya Tash would appear to be a little way up-stream from Turtkul, at the head of the delta by which the Amu Darya enters the Aral Sea, and from this point the canal, said to be 1100 kilometres in length, will circle the Sarakamysh depression to join the Uzboy channel, an old course of the Oxus now dry, which reaches the Caspian Sea near Krasnovodsk.

It is claimed that the canal will command an area of some 5000 square miles, in the Amu Darya delta and the desert lands between the Aral and the southern Caspian, which will be planted with cotton; it will also provide water for pastures in the Kara Kum desert and for forest belts bordering the newly irrigated land; pipe lines and pumping stations will supply water from the canal for industrial and urban use. The Amu Darya has long supported a considerable area of irrigation in its middle reaches. A curious feature of the plan is that the diversion of water from the Aral Sea will cause its level to fall (it is said by 20 feet) and this recession of the sea is itself to provide a part of the new land for irrigation.

The planned intake of the canal is from 12,000 to 14,000 cubic feet per second, with a possible later increase to about 21,000 cubic feet. Hydro-electric power will be generated at the Takhya Tash dam and at two dams on the canal itself. The main canal is to be navigable and will link the Amu Darya and the Aral Sea with the Caspian (the difference in level between the two seas is about 240 feet) and so, by way of the Volga, with the main waterways of Russia. Other great projects recently announced in the U.S.S.R. provide for the regulation of the Volga by dams at Kuibyshev and Stalingrad to provide power, irrigation water and an improved channel for navigation.

THE *STAR ALMANAC FOR LAND SURVEYORS*, 1951

Changes in the *Nautical Almanac*, and the publication of the separate volume of *Apparent Places of Fundamental Stars* in 1941, have resulted in there being two ephemeral publications neither of which really meets the requirements of the land surveyor. The *Abridged Nautical Almanac* gives the positions of only 172 stars, and with the inadequate accuracy of $0^{s}{\cdot}1$, and in 1952 it will be in a form still less suitable for land surveyors. The need for a special publication for surveyors was discussed at the Empire Survey Officers' Conference in 1947 and a committee was then set up under the chairmanship of Dr. de Graaff Hunter. The outcome is the publication of the *Star Almanac for Land Surveyors* for 1951.

The new publication will be very welcome to those engaged in field astronomy, who have latterly had to carry with them both the *Nautical Almanac* and the *Apparent Places of Fundamental Stars* to cover their possible requirements. In 1951 they will need for the same purpose only the new Almanac, a booklet of 66 pages which costs 3 shillings, compared with the two volumes of 1158 pages which cost £2 13*s* 6*d*. These 66 pages include sun tables and the 650 stars whose magnitude is not fainter than 4·0. There are changes in form which the surveyor who is accustomed to the full *Almanac* and not the abridged version will find unfamiliar and they will affect the teaching of field astronomy from text books based on the old almanacs.

A detailed description of the new almanac cannot be attempted in this note; the nine pages of introduction and illustration explain its arrangement and use

very clearly. The terms 'Equation of Time' and 'Siderial Time at 00 hrs. G.M.T.' have been replaced by the values E and R; E being the difference between the Sun's Greenwich Hour Angle and Universal Time (*i.e.* G.M.T.) and R being the difference between G.H.A. Aries and Universal Time. The precision of tabulation in the Sun tables is $0'{\cdot}1$, in the star tables $1''$. Special tables are provided for interpolation (some of them "critical tables") which dispense with much tedious slide-rule work and the conversion of hours, minutes and seconds into decimals of a day. The almanac includes complete tables for Refraction.

The new Almanac may not at first appeal to those who have hitherto only used the full *Nautical Almanac* infrequently, but to those who use it constantly its great advantages should soon become apparent. A. S.

A CHANGE IN THE GRID REFERENCE SYSTEM ON ORDNANCE SURVEY MAPS

The system of gridding Ordnance Survey maps of Great Britain produced and published for civil use is the same as that used by the armed forces, who, jointly with the armed forces of the Dominions, the U.S.A. and other countries, use uniform military systems throughout the world. There is, however, a slight difference between the civil and military method of giving grid references.

It is essential that the civil and military authorities in Great Britain should use the same method and it has therefore been decided that the Ordnance Survey should adopt the military method as soon as practicable. The change of method will not affect the general appearance of the maps in any way, nor will it affect the "Normal National Grid Reference" now used on the civil small scale maps of the Ordnance Survey, but the "Full National Grid Reference" will be modified so that the 100 km. square will be designated by two letters instead of by two figures and an oblique stroke. Thus the "Full National Grid Reference" of a point which is now (say) 51/519465 will become TQ 519465. The method of giving map references on the Ordnance Survey large scale plans will also be altered to conform.

The change will be carried through gradually and no alteration will be made on maps that have already been printed. It will be made as new sheets are produced or as old sheets are reprinted. The figures which designate the 100 km. squares under the present method will continue to be shown, but in brackets, in addition to the new letters until the transition to the new method is complete. The new method of using grid references will be explained on the maps themselves and, in due course, in pamphlets published by the Ordnance Survey.

THE RETRIANGULATION OF NORTHERN IRELAND

The necessity for revising the 25-inch and 6-inch maps of Northern Ireland has emphasized, as it did in Great Britain, the inadequacy of the secondary triangulation, which had not in either country been rigorously adjusted to the principal triangulation. In both countries the tertiary triangulation was generally computed without adjustment by rectangular coordinates on local county projections, and did not form therefore a continuous system of points covering the whole area.

To produce a revised and uniform series, a new triangulation of Northern Ireland, rigorously adjusted to the old primary triangulation, will have to be observed. A start has been made in Antrim and Down and the whole triangulation is expected to take about ten years to complete. In the meantime it is proposed to observe the minor triangulation round Belfast so that a start may

be made next spring on the new 50-inches to the mile survey which it is proposed to make of the larger cities and towns.

In recording the commencement of this new survey it is interesting to note that the last major triangulation took place more than 100 years ago. Observations were then made with 36-inch Ramsden theodolites weighing about 200 lb. and the longest side of 111 miles, from Slieve Donard to Sca Fell, was observed to a limelight, then newly invented by Thomas Drummond (later Under Secretary of State for Ireland).

In the proposed triangulation, observations will be made with a geodetic theodolite weighing about 45 lb., and with glass circles 5 to 6 inches in diameter. Each station will consist of a buried mark, over which a concrete pillar will be built containing a metal "spider" accurately centred over the mark.

A. S.

A HYDROLOGICAL STUDY OF A LEBANESE RIVER

Mr. Ibrahim Abd el Al, Head of the Hydrological Section of the Lebanese Ministry of Works, has recently published the results of his department's investigations on the Nahr Ibrahim river. It is planned to develop this river, the Adonis of the ancients, as the country's chief source of electric power and a careful study is therefore being made of the river and its basin. Although the text of the monograph 'Nahr Ibrahim' (Beyrouth, Catholic Press, 1947) is in Arabic, the plentiful and useful maps and diagrams, with legends in French, are readily comprehensible.

The river is a young one and massive structural forms are dominant in the topography. The development of a regular drainage network is inhibited, in this eastern Mediterranean climatic zone, by the almost total drought of six months in the year and by the permeability of the calcareous rocks which form most of the basin. Tributaries run dry in summer but the main river is supplied by perennial springs. These are fed by reserves, stored in the calcareous massifs of central Lebanon, which are maintained by precipitation in winter and by the slow melt of snow on the summit plateaux in summer. The regime varies with the proportion of rain to snowfall each year and the flow reflects (besides rainfall) temperature changes, of diurnal and longer term, which govern the rate of snow melt on the high land and therefore the output of the springs. Rapid run off after rain is a consequence of the prevailing steep slopes; increases as great as from 4 to 22 cubic metres per second in four hours have been recorded by a flow meter installed in the lower section of the river. In an average year the flow in the river is 25·5 litres per second for every square kilometre in the basin, a remarkably high relative figure which reflects the karstic characteristics of the basin and the concentration of precipitation in the season of low evaporation.

N. N. L.

THE LENGTH OF THE NILE

The note on the world's longest rivers recently published in the *Journal* (114 (1949) 231–2) by the Rev. O. R. Walkey has been criticized by Dr. H. E. Hurst, who refers us to a precise investigation of the length of the Nile made by the Irrigation and Physical Departments in Egypt. This measurement was based on the largest scale maps available and special precautions were taken to avoid inaccuracies in measurement and the distortions introduced by the map projections and the shrinkage of the paper. The accepted length of the Nile from its Luvironzo source to the Rosetta mouth was 4160 miles; the Damietta branch of the delta is 4 miles longer. Dr. Hurst points out that the method employed by the Rev. O. R. Walkey—the stepping off of the river lengths with dividers

from the 1/M maps—must be much less accurate and that many minor bends must be omitted on maps of so small a scale.

This would not however account for the very large discrepancy between Dr. Hurst's figure of 4164 miles and Mr. Walkey's of 3930. Mr. Walkey has now been through his figures again and finds that they agree as far as the second cataract, but that by an error in transcription his total is 100 miles too low; he would therefore amend it to 4030. He agrees that this figure is necessarily much less accurate than Dr. Hurst's, but points out that only measurements from 1/M maps are available for a comparison of the lengths of the world's rivers on a common basis. The estimated difference in length between the Nile and the Amazon (4050 miles) is thus so small as to leave it in doubt which is the longer river. The Nile is navigable not only to the first cataract but to the second, a distance of 960 miles.

THE MAKING OF GEOGRAPHY TEACHING FILMS

The pamphlet with this title, prepared by the Films Committee of the Geographical Association and published by the National Committee for Visual Aids in Education, is in some measure a sequel to the earlier and more substantial publication, 'Geography teaching films' prepared by the same committee. The present pamphlet explains the stages in the production of an educational film and is directed chiefly to helping the educational adviser for such a production. To such, especially if inexperienced, it will prove very helpful; it may also be of interest, and certainly instructive, to all who are regular film users. Heavy demands will be made on the time of an educational adviser if he is to carry out all that the Committee expects of him, demands that are not very satisfactorily met by a short period of secondment from a Local Education Authority. Nevertheless the role of the teacher in advising on the making of a teaching film is of first importance and the Committee has performed a useful task in setting out what it involves. The price of the pamphlet is 1 shilling. E. W. H. B.

UNIVERSITY NEWS

BIRMINGHAM UNIVERSITY

Although the University has been celebrating its Jubilee this year, having received its Charter in 1900, the Department of Geography can hardly claim to be half that age since Birmingham was the last of the larger Universities to establish an independent department in the subject. Despite this, it now has a full-time academic staff of seven in addition to the Professor, while it also possesses the nucleus of a technical and clerical staff, so essential in the work of any effective University geography department. Some indication of the expansion that has taken place during recent years may be gained from the fact that, last session, there were some ninety special Honours students reading for first degrees in Geography, either in Arts, Science or Commerce, quite apart from those taking the subject for higher degrees, or as a subsidiary subject for some other degree. Additions to the staff since our last note in the *Journal* have included Mr. G. J. Butland, a former student of the Department, and Mr. M. B. Stedman, of Cambridge. Since graduating, the former has spent many years in teaching and research particularly in Bermuda and in Chile; and as a token of the high regard in which he is held in the latter country it is a pleasure to record that the Chilean Government has appointed him as its Honorary Consul in Birmingham, a type of distinction which is probably unique among the staffs of Geography departments in this country. Mr. G. T. Warwick has been appointed British representative on the *Comité permanent des Congrès*

internationaux de Spéléologie. He has also been re-elected Chairman of the Cave Research Group of Great Britain for 1950.

The past session has also witnessed a notable extension of geographical activities in the field of Extra-Mural studies with the appointment of Miss P. A. Nicklin, M.A. (Birmingham) as a full-time Lecturer in Geography in that Department of the University. Undoubtedly there is work of the highest significance to be done in this sphere, and Miss Nicklin has already conducted successful courses not only in Birmingham but also in Bewdley, Dudley and other local centres. Short courses on such topics as meteorology and climatology, the growth of Birmingham, and local studies have also been given for Extra-Mural audiences by various members of the internal staff.

During the Easter vacation a very successful Inter-University Student Geographical Conference—the first of its kind in this country—was held here, and a full programme of lectures, discussions, field excursions and social events was spread over four days. The visiting speakers included Sir John Russell, F.R.S., Professor Axel Sömm, of Norway, Professor E. G. Bowen, and Professor Griffith Taylor, of Toronto. The latter also gave a series of lectures in the Department on such topics as Canadian and Australian settlement, Fiji, Hawaii, Geopacifics and urban geography, which were much appreciated and which stimulated vigorous and fruitful discussion.

The visit of the British Association from August 30 to September 6 has necessarily occupied much time and thought on the part of all members of the staff, particularly in preparation for the work of Section E, including the organization of its field excursions, and the publication of the scientific survey, 'Birmingham and its regional setting.' This substantial volume was planned and edited primarily within the department, the editorial board of three including Professor Kinvig and Mr. M. J. Wise, the latter as honorary editor. It differs from some previous Association handbooks in pursuing more consistently a central theme—the definition of the Birmingham district and its evolution as a distinctive region from early human times to the present day. Seeing that the local area is regarded by the department as an essential field laboratory for the pursuit of studies in areal differentiation, it is not surprising that a good deal more than half the Birmingham handbook was written by existing or former members of the staff or student body of the department. Despite pre-occupation with this work, research has also been continued in other directions, including the geomorphology of Derbyshire, the evolution of settlement in Denmark, the historical geography of the Isle of Man, and the human geography of southern South America. R. H. K.

THE COLLEGE OF ARTS AND SCIENCES, BAGHDAD

This college was founded last year to provide teaching to degree standard and serve as the nucleus of a future University of Iraq; geography is included in the initial range of subjects offered. Professor J. H. G. Lebon, formerly of the University of Ceylon, has recently been appointed to the new institution.

THE MEETING OF THE BRITISH ASSOCIATION, 1950

The meeting of the British Association for the Advancement of Science, held at Birmingham from August 30 to September 6, was, except for the centenary meeting of 1931, the best attended of any in the present century. The President, Sir Harold Hartley, K.C.V.O., C.B.E., M.C., F.R.S., delivered an address on "Man's use of energy," clearly in succession to last year's address by Sir John Russell; not its least interesting feature from the geographer's point of view being his continued insistence on the importance of the great inequalities in the

distribution over the globe of all the sources of energy. To many, one of the most notable features of the meeting was the evening discourse by the Bishop of Birmingham. The parcel distributed before the meeting, containing the handbook of the city and the scientific survey of the Birmingham region, was widely appreciated; the latter, one of the many evidences of the close cooperation between Town and Gown that particularly characterised this meeting, was very largely the work of the University Department of Geography, to whom the President's congratulations were particularly offered.

Section E (Geography) found itself better housed and cared for than at any meeting within easy memory. True, the morning sessions were long, but the half-crown four-course lunch which was available at the adjoining Training College at half-past one was worth waiting for. About 150 persons availed themselves of it each day—a fair measure of the day to day strength of the Section. For the excellence of all the local arrangements the Section had Professor R. H. Kinvig and the Local Secretary, Mr. B. L. C. Johnson, very much to thank.

The programme of the Section was as usual a full one. The first morning was occupied with a group of papers dealing with the geography of the Birmingham region. After a general introduction by Professor Kinvig, Mr. M. J. Wise traced with lucidity and conviction the development of Birmingham and its industries since 1750, Mr. Johnson offered an account of the eighteenth-century iron trade of the Midlands based on a scholarly study of contemporary trading accounts and Mr. H. Thorpe unrolled a panorama of a millenium of Lichfield history. The afternoon was appropriately occupied with two local excursions—that to the Black Country being largely concerned with the cultural landscape, and that to the Clent Hills with the morphology.

The Presidential address, opening Friday morning's programme, made a wide survey of the evidence culled by many workers regarding the upland plains of Britain and their significance in the fields of both denudation chronology and regional geography. Two papers on land-use mapping followed—one by Mr. A. J. Hunt making a praiseworthy attempt to deal with some matters of principle and practice in urban mapping, and the second by Mr. D. N. Kendall infecting the audience, including Sir Harold Hartley, with a Canadian sense of the urgency of mapping resources, and enthusiasm for the new techniques now being applied across the Atlantic. During the afternoon two interesting papers by Mr. R. W. Steel and Mr. K. M. Buchanan (the latter on a visit from Ibadan) dealt with aspects of the geography of West Africa, a topic taken up again on Monday morning when Mr. H. R. Jarrett spoke of agriculture in the Gambia. Cognate matters were dealt with by Miss M. Marshall in a paper on Cyprus. The remainder of Monday morning was devoted to a discussion on geographical terminology in which junior and senior, lay and professional views were all to the fore; and the desirability of moving towards an authoritative glossary of geographical terms was made evident. In the afternoon Professor Beaver dealt with the geography of coke, and Mr. Moiseley and Professor Edwards with the urban geography of the Potteries and Corby respectively.

The whole of Tuesday morning was devoted to a joint discussion with Section C on the preglacial evolution of the British land surface. Professor Linton suggested that some elements in the river system in the Midlands and North Wales may have survived from earlier Tertiary times and Mr. G. T. Warwick, Dr. Marjorie Sweeting and Mr. W. G. V. Balchin traced the later phases of erosion in Derbyshire, County Clare and Exmoor. Dr. J. F. Kirkaldy expressed due geological caution and a stimulating discussion followed. In the afternoon Mr. H. C. Brookfield offered the fruits of work on the historical

geography of the south-coast ports, and Mr. Emrys Jones a thoughtful paper on settlement study. Of the two papers on Wednesday morning one was by Mr. D. J. Sinclair on the Ukraine, and the other by Professor Davies elaborated his thesis that Columbus was preceded by a few years in the discovery of America by the Portugese: the thesis may yet have some way to go to convince the scholars but it is undeniably attractive.

Nor was this all. Geographers contributed to discussions in other Sections —notably Mr. A. T. A. Learmonth to one on "Forestry in water catchment areas," Professor Miller to one on "The climatic limits of vegetation," Professor Wooldridge to "The present position of the theory of continental drift" and Professor Beaver to "The rehabilitation of derelict areas." At the weekend Professor Kinvig and his colleagues earned the gratitude of the Section by their well planned excursions to Edge Hill, Cannock Chase and Lichfield, while one fortunate party had a memorable day when Lord Rennell displayed to them the beauties of his own countryside and his own house. And there was of course a Section Dinner which was, as always, a success; our foreign guests on that occasion were three Vice-Presidents of the International Geographical Union— Professor Marguerite Lefèvre of Louvain, Professor Orlando Ribeiro of Lisbon, and Professor George Kuriyan of Madras. At that dinner Professor Bowen, in giving us the toast of "The Section and the President," praised Professor Wooldridge for presiding in person over almost all the sessions of the Section and for the aptness and breadth of interest revealed in his comments on the diverse papers read. Those congratulations must find their echo here.

Next year's meeting at Edinburgh is to be held under the Presidency of H.R.H. The Duke of Edinburgh and will precede the Edinburgh Festival. It is thus a special occasion for all concerned, but particularly so for geographers, for Section E will be celebrating its centenary, the president of the Section being Dr. O. J. R. Howarth. Offers of papers to be read at this meeting should be sent immediately to the Recorder, Professor D. L. Linton, The University, Sheffield, 10. D. L. L.

THE FRENCH INTER-UNIVERSITY GEOGRAPHICAL CONGRESS, MAY 1950

The thirty-fourth annual Inter-university Excursion, made this year from Bordeaux through the Périgord to Angoulême and the Charentes, was the first to be styled "Congress." As a precedent, two geographers were invited from each of a number of other countries and representatives came from Belgium, Switzerland, Portugal, Spain, Yugoslavia and Britain. The principal regional leaders were Professor Papy and M. Enjalbert from Bordeaux, M. Guillen and M. Arqué for the Angoumois, while M. Fénelon being unable to lead in Périgord, his place was taken there by M. Clozier (Inspecteur).

The theme of the congress, it had been agreed, was to be a discussion of field problems rather than a regional *exposé*. Emphasis was laid upon newer aspects of geomorphology. There were many illuminating, if controversial, outlines of the newer observations and theories of the genesis of land-forms, soils and subsoils in Aquitaine. Our attention was directed by Enjalbert and others to conditions prevailing when the Central Plateau—faintly silhouetted to the west— was snow-covered and supported glaciers, and when the surrounding periglacial area we traversed was subject to seasonal freezing and thawing in a colder, drier climate than the present. Sand and clay pits were frequently examined to illustrate effects of former soil-creep and wind-transport, and sandy soil-wash (especially on south-east slopes). Remarkable examples of the upheaval of certain laminated limestones by frost and thaw were seen, 40 or 50 centimetres

below the surface, in quarries. All these indications of "cryoturbation" (soil disturbance, erosion and deposition due to extreme cold) are being compared with present conditions in Greenland by the expeditions led by Paul Émile Victor. In summing up towards the close of the excursion, the question was put and answered: "Since we are agreed that the basic concepts of 'normal' (*i.e.* temperate) fluvial erosion are insufficient to explain many of the land-forms we see, must we not seek to distinguish the different regional types of land-form and associated subsoil and soil in terms of other causal factors? This calls for deliberate comparisons with periglacial or arctic conditions and a re-examination of changes in base levels and in karstic factors in the limestone tracts." These factors were also linked to the findings of prehistory, brilliantly outlined by M. Guillen on the site of La Chaise near Angoulême.

A comment made at the congress concerns an orientation of modern geography, in Britain no less than France. "The living *physique*" of the land has been a leading concern of the French school from its beginnings: if Vidal de la Blache owed inspiration to the historians or de Martonne to Davis, Max Sorre would acknowledge a debt to the geo-botanical school of Montpellier, led by Ch. Flahault who was also a master of Herbertson and other British initiators. On this excursion both professors and students sometimes missed what would have made the expositions even more truly geographical. Our geological examination of quarries and pits might have been more closely related to the silhouettes and outlines of the land-forms before us, and still more so to soil-colours, gradients and the landscape-pattern with its distribution of crops and crop-responses. Not that the congress was without admirably sketched, though brief, accounts of the "human" geography. But except perhaps in the Landes, recently so sorely-stricken, one would have hoped for a closer correlation of land-form and its geologic or geomorphic causation, with land-form and its direct biotic effects, and so to human result and reaction on a topographical as well as regional scale. Traversing the country rapidly, one could not hope to perceive the living topographic synthesis which our guides' intensive inquiries could have offered.

A happy feature of the excursion was its cordiality. The party totalled about seventy, the senior teachers and *assistants* (junior lecturers) bringing selected students. Travel was by *autocar*, with early departures and late arrivals. This —with due, judicious sampling of the most famous economic product of the Bordelais *en route*—made the tour strenuous and discussion keen. Foreign guests were made welcome. The writer particularly thanks his hosts for their active interest in the revival of a Franco-British link in the miniature regional museum or "Outlook Tower" founded by the late Paul Reclus on the splendid castle-site of Domme, above the Dordogne, but it had suffered from use by German machine-gunners during severe fighting in 1944. Teachers, students and guests mixed happily, and the last vestige of formality disappeared with the traditional singing of ditties improvised by the students in honour of their teachers—an "honour" from which guests were not exempt! A. G.

LEVERHULME RESEARCH FELLOWSHIPS AND GRANTS, 1950

Among the research grants awarded by the Trustees of the Leverhulme Research Fellowships for 1950 the following are for geographical studies: B. H. Farmer, Fellow of St. John's College, Cambridge, for studies on pioneer settlement in Ceylon; J. H. G. Lebon, formerly Professor of Geography in the University of Ceylon, for studies on rural settlement in Scotland; J. W. Wright, Inspector of Surveys, Sudan Government, for studies on the hydrology of the Sobat and its relation with the White Nile.

Further information relating to grants from this foundation may be obtained from the Secretary, Leverhulme Research Fellowships, 7, Bedford Row, London, W.C.1.

OBITUARY

FIELD MARSHAL SMUTS

By the death of Field Marshal Smuts at the age of eighty on 11 September 1950, the Society has lost one of its oldest and most distinguished Honorary Members. His reputation as a statesman and as a man was world wide and has been recorded in the obituary notices that have appeared elsewhere. He had been an Honorary Member of the Society since 1917 and had addressed it on two memorable occasions; on 28 January 1918 he read a paper at the Evening Meeting on "East Africa" [1] and, at the Annual General Meeting on 13 June 1949, he again addressed the Society and presented the Medals and Awards.[2]

His paper of 1918, although it deals primarily with the East African campaign which he himself had conducted, is still important for the far-sighted views he expressed on the geographical factors inherent in the development of Africa and on the place of Africa in world strategy. "People talk of the expansion of Europe," he said "but it is really more instructive to speak of the contraction of the globe, and the bringing together of the continents into far more intimate relations than before." And he prophesied "aerial navigation may revolutionize the present transport situation beyond anything dreamt of to-day."

At the Annual General Meeting last year Field Marshal Smuts recalled that his earlier paper had been delivered during a German air raid on London. Touching on the present international situation, he again referred to the security of world communications and, commenting on the South African occupation of Marion and Prince Edward islands, drew attention to the potential significance of these and other sub-Antarctic islands to that security.

MARTIN DE SELINCOURT

A great variety of people have lost in Martin de Selincourt, who died last August in his eighty-sixth year, a wise counsellor and valued friend: few men can have touched and personally benefited such widely differing lives at so many points.

Apart from the family firm of Selincourt and Sons, his business associations included Swan and Edgar, Ltd. (of which he was Chairman) and the publishing company of Rupert Hart-Davis, Ltd. He was also instrumental in forming the London Employers' Association, of which he was Chairman for many years. Another circle of activities made him a member of the Westminster City Council; one of the first members of the Royal Cruising Club and the Royal Automobile Club; a keen gardener—his garden at Brooklands near Southampton, a show place of the district with its many Asiatic primulas, camellias, azaleas and rhododendrons, has been regularly thrown open to the public; and a supporter of the stage—he was interested in the production of A. A. Milne's plays.

In 1934, when Michael Huxley (subsequently editor) told him of the negotia-

[1] *Geogr. J.* 51 (1918) 129–49
[2] *Geogr. J.* 114 (1949) 124–6.

tions then proceeding for the foundation of the *Geographical Magazine*, Martin de Selincourt became one of the early guarantors of initial capital and later the first Chairman of the Company formed to publish it. He saw clearly the potential value of such a 'commercial venture with a public purpose' to the cause of geography, both in attracting more people to a geographical point of view and in providing funds for exploration and research. He subsequently became a member of the Council of the Royal Geographical Society (1939–42) and as such was instrumental in fostering cordial relations between the Society and the *Magazine*.

The family background from which he sprang and to which he contributed is a remarkable one. His grandmother, who was English, and her son Charles Alexander de Selincourt came over from France and started the wholesale dress business (she making mantles and he selling them) which was subsequently developed by Martin and his brother Wilfred. The gifted family of which he was the eldest included the Professor of Poetry Ernest, the critic Basil and the writer Hugh. By his first marriage in 1888 with Mabel, daughter of Mr. William Speed, K.C., he had four sons and one daughter (Mrs. A. A. Milne); by his second marriage in 1933 with Nancy, daughter of Captain R. C. Brown, M.C., a son and a daughter.

To Brooklands on the Hamble river, which he owned for thirty years, came not only the members of the many local clubs and organizations to which he gave personal interest and generous support, but also, during the war, hospital nurses, naval inventors and ferry pilots who were billeted there, and refugees from Portsmouth and Southampton. All these (besides his closer friends and relations) will remember with gratitude the calm face, as of a gentle hawk, the twinkling eye and flashes of rather dry humour that marked this essentially civilized man; as well as his wise advice, never volunteered unsought but, if sought, never withheld and seldom given in vain. M. H. H.

CORRESPONDENCE

URBAN HINTERLANDS IN IRELAND

Mr. F. H. W. Green's extremely interesting article in the September *Journal* includes some asides on Eire which hint that its marketing and transport conditions differ considerably from those in Northern Ireland, England, Wales and Denmark. This might well be the subject of further research as Mr. Green suggests. Certain points appear significant. First, in Eire transport services are now unified under a government-sponsored combine, Coras Iompair Eireann (Irish Transport), which controls trains, buses and lorry services, except in those areas where the Great Northern Railway runs trains and buses. A few private buses still survive, or did so until recently, but for all practical purposes the system is unified. The shortage and expense of coal during and since the war years has reduced railway services below the pre-war level; one effect of the lack of trains, and the closing of certain branch railways has been the development of long-distance bus services under public ownership. If these happen to lead to a market town at a convenient time, they are used; but their main purpose is to supplement the rail services for journeys of an occasional character.

Second, motor-bus services have never penetrated many parts of the country at all because the people go to town by cart (donkey or horse), bicycle or even on foot. They have done so for generations and to this day hardly expect to be conveyed everywhere by mechanical means. This may seem a primitive survival of the power of self-locomotion once possessed by people elsewhere—an Irish heritage; the writer knows of cases where employees travel on bicycles as much as eleven miles to a factory. Public lorry services are however reaching many remote places where no bus has yet been seen.

A third—and perhaps even more important consideration is that although the weekly shopping is normally done in country towns, many people rarely visit them and buy goods from vanmen or country creameries: some people rarely go to town at all. In many towns, the weekly market has disappeared, or exists as a sadly decayed affair in the form of a few carts with vegetables, perhaps a calf or pig, seeds or fertilizers, on one particular day of the week. On this day more people come to the town than usual, but it is hardly a conventional market-day. Eggs are sold either to the vanmen, the country creamery, or to dealers in the town. Far more important than the market are the fairs held monthly in every town and many villages: inquiries made from farmers show that it is the fair offering the best prices which will be favoured, which may not necessarily be in the nearest town. And even the fairs do not receive all the cattle, as some are sold to dealers on the farms.

All these complexities suggest that any effort to discover the urban hinterland of an Irish town by bus services is doomed to failure. A recent effort to discover the circulation areas of local newspapers has produced some interesting results[1]—the more so because only in the south-east is there a chain of newspapers owned by a company. It may be along this and other lines, such as detailed local inquiries from shopkeepers in towns and villages, or families on farms, that recognition of the market areas of Irish towns may be profitably investigated.

One last point. On page 72 the statement is made that "the proportion of primary agricultural workers to secondary workers (in an area of Norfolk) is in the ratio of 2 to 1 . . . where the agriculture is of a different type the proportion is a little different, but the divergence is not likely to be great." This may be true for England and Wales, but it is certainly not true in Eire, where some poor western rural districts have as much as 90 per cent. of their "employed population" working on the land, whereas some richer eastern rural districts have less than 60 per cent. This implies that where the buying power is low, there are few shopkeepers, garage proprietors, servants, or others providing services. It would be interesting to see whether Scotland provides an analogy closer than that of England to Ireland.

T. W. FREEMAN

School of Geography,
University of Manchester,
3 *October* 1950.

[1] J. P. Haughton, "Irish local newspapers: a geographical study," *Irish Geography*, vol. II, no. 2, 1950, pp. 52–57; "Local newspapers and the regional geographer," *The Advancement of Science*, vol. III, no. 25, 1950, pp. 44–45.

ADDITIONS TO THE LIBRARY AND MAP ROOM

EUROPE

THE LAND OF BRITAIN: its use and misuse
By L. D. Stamp. 2nd ed. 11×8½. viii +508 pp. Maps and diagrams. *London: Longmans Green*, 1950. 45*s*

THE CITY OF BIRMINGHAM OFFICIAL HANDBOOK
Ed. by F. W. Bradnock. 9½×6½. xiv +288 pp. Illustrations. *Birmingham: for the Corporation*, 1950

DOWNS AND WEALD
By P. Thornhill. 3rd ed. 7½×5. 164 pp. Illustrations and sketch-maps. *London: Christophers*, 1950. 4*s*

LA STRUCTURE AGRAIRE ANCIENNE DU DEVON ET DU CORNWALL ET LES ENCLÔTURES DES XIIIe ET XIVe SIÈCLES
By Pierre Flatrès. (*Chronique géogr. des pays celtes*, 1949, 4–14)
The 'Chronique' is the publication of the 'Laboratoire de Géographie' in the University of Rennes.

THE ORIGIN OF THE FENLAND MERES: Fenland homologues of the Norfolk Broads
By J. W. Jennings. (*Geol. Mag.* 87 (1950) 217–25; sketch-maps)

THE TOWN AND DISTRICT OF ROSCOMMON
By T. W. Freeman. (*Irish Geogr.* 2 (1950) 61–76)

DE RIJN, HET WEST DUITSE INDUSTRIEGEBIED EN DE NEDERLANDSE ZEEHAVENS
By F. L. F. Aarens. (*Tijds. Econ. en Sociale Geogr.* 41 (1950) 71–87)
Discusses the advantages offered by the Dutch Rhine ports for the development of West German trade.

FRANCE: a regional and economic geography
By H. Ormsby. 2nd ed. revised. 8½×5½. xiv+526 pp. Maps and diagrams. *London: Methuen*, 1950. 25*s*
Dr. Ormsby's well-known book was first published in 1931. In this edition the physical geography and regional studies are unchanged, but the economic section has been revised and extended by Mr. F. J. Monkhouse.

LE VERSANT ATLANTIQUE DES PYRÉNÉES ET SON AVANT-PAYS
By E. Taillefer. (*Rev. de géomorphologie dynamique*, 1 (1950) 101–20; diagrams)
Discusses a "typical process of quaternary landscape-making on a mountain border."

LE PAYS DE VIVARAIS
By Elie Reynier. 4th ed. 10×6. 238 pp. Maps and illustrations. *Yssingeaux: F. J. Thomas*, 1947. 10*s*

DAS MITTELRHEINTAL: Formen und Gestalt
By Dietrich Gurlitt. (*Forschgn. z. deut. Landeskunde*, 46 (1949) viii+160 pp.; diagrams)

SCHRIFTEN UND KARTEN ZUR LANDESKUNDE NORDWESTDEUTSCHLANDS 1939–45
By W. Müller-Wille. (*Westfäl. Geogr. Studien*, 1 (1949) 118 pp.)

NURNBERG: die alte Reichsstadt in Franken auf dem Wege zur Industriestadt
By Erich Otremba. (*Forschgn. z. deut. Landeskunde*, 48 (1950) 140 pp.; maps and illustrations)

DIE VOGELSBERG
By Helmut Blume. (*Die Erde, Berlin*, 1949–50, 273–99; illustrations)

DAS KLIMA GRIECHENLANDS
By Alfred Philippson. 8×5½. 238 pp. Maps. *Bonn: F. Dummler*, 1948. 30*s*

ITALIAN LIFE AND LANDSCAPE. I. ROME AND SOUTH ITALY
By Bernard Wall. 8½×5. 128 pp. Illustrations. *London: Paul Elek*, 1950. 12*s* 6*d*
Though much of this book is devoted to architecture and history, the author does not neglect contemporary Italy, from which he believes the English-speaking countries can learn much.

BY ITALIAN SHORES (GENOA TO NAPLES)
By Eric Whelpton. 8½×5½. 186 pp. Illustrations. *London: Evans Bros.*, 1950. 9*s* 6*d*

LA CALABRIA SETTENTRIONALE
By Carlo Traversi. (*L'Universo*, 30 (1950) 533–46; illustrations)

EL REGADIO EN LA ESPAÑA PENINSULAR
By Jose Terrero. (*Estudios geogr., Madrid*, 11 (1950) 251–320; sketch-maps)

LE DELTA DE LLOBREGAT: ÉTUDE DE GÉOGRAPHIE HUMAIN

By P. Deffontaines. (*Rev. géogr. des Pyrénées*, 20 (1949) 137–74; illustrations)

ISRANDSTUDIER I SÖDRA BOHUSLÄN

By Nils Björsjö. (*Sveriges Geol. Undersökning* Ser. C. Nr. 504 (1949), 322 pp. maps and illustrations. English summary)

Studies of marginal deposits and of ice borders in Southern Bohuslän, Sweden.

ASIA

IN THE MOUNTAINS AND DESERTS OF CENTRAL ASIA

By V. A. Obruchev. $8\frac{1}{2} \times 5\frac{1}{2}$. 244 pp. Illustrations and diagrams. *Moscow: Academy of Sciences*, 1948. [*In Russian*]

LA STRUCTURE DU PROCHE-ORIENT: ESSAI DE SYNTHÈSE

By E. de Vaumas. (*Bull. Soc. R. de Géogr. d'Égypte*, 23 (1950) 265–320; diagrams and illustrations)

FIVE CITIES OF THE GANGETIC PLAIN; a cross-section of Indian cultural history

By O. H. K. Spate and Enayat Ahmad. (*Geogr. Rev.* 40 (1950) 260–78; maps)

KOREA: eine Landeskunde auf Grund eigener Reisen und der Literatur

By Hermann Lautensach. (*Geographische Handbücher.*) 9×6. xvi+542 pp. Maps and illustrations. *Leipzig: K. F. Koehler*, 1945. 82*s*

ECOLOGICAL OBSERVATIONS ON THE GREAT KHINGAN EXPEDITION

By Kinji Imanishi. (*Geogr. Rev.* 40 (1950) 236–53; illustrations)

THE MALAYS: a cultural history

By R. Winstedt. Revised ed. $8\frac{1}{2} \times 5$. viii+198 pp. Illustrations. *London: Routledge and Kegan Paul*, 1950. 15*s*

THIS WAS SINGAPORE

By R. C. H. McKie. $8\frac{1}{2} \times 5$. 222 pp. Illustrations. *London: Robert Hale*, [1950]. 12*s* 6*d*

Description of Singapore and its peoples by a journalist who lived there from 1937 to 1939

DIE PHILIPPINEN

By Albert Kolb. (*Geographische Handbücher*). 9×6. 504 pp. Maps and illustrations. *Leipzig: K. F. Koehler*, 1942. 48*s*

PARADIES IN LICHT UND SCHATTEN

By Karl Helbig. 9×6. 308 pp. Illustrations. *Braunschweig: Vieweg-Verlag*, 1949

The author deals with most aspects of the geography and economy of the East Indian archipelago, contrasting the wealth of natural resources with the population pressure and the living standards; the indigenous cultures with the introductions from the outside world; and the natural landscapes with the developed areas.

AFRICA

AUTOUR DU PROBLÈME DU DESSÉCHEMENT AFRICAIN

By T. Monod. (*Bull. Inst. franç. d'Afrique Noire*, 12 (1950) 514–23)

The Institute is proposing to continue the study of this problem, with the issue of a questionnaire.

LE PROBLÈME DÉMOGRAPHIQUE NORD-AFRICAIN

By L. Chevalier. $9\frac{1}{2} \times 6$. 222 pp. Maps. *Paris: Presses Universitaires*, 1947. 6*s*

AFRIQUE OCCIDENTALE FRANÇAISE

Ed. by Eugène Guernier. 2v. (*Encyclopédie coloniale et maritime.*) 12×8. x+392; x+400 pp. Illustrations and maps. *Paris: Encyclopédie colon.*, 1949. £5 10*s*

A systematic treatment of all aspects of these French territories, geography, natural history, economics and social structure, with numerous illustrations and maps.

L'ÉLEVAGE EN AFRIQUE OCCIDENTALE FRANÇAISE

By G. Doutressoulle. $10 \times 6\frac{1}{2}$. 298 pp. Maps and illustrations. *Paris: Larose*, 1947. 15*s*

LA PRESQU'ÎLE DU CAP-VERT

(*Études Sénégalaises* (*Inst. franç. d'Afrique noire, Dakar*), No. 1 (1949) 316 pp.; illustrations and sketch-maps.)

A collection of essays on the physical geography, climate, vegetation, natural history, etc., published to commemorate the fifth centenary of the discovery of Cape Verde and the first international conference of West African scientists.

LE PORT DE PORT-SAÏD

By Paul Reymond. (*Mém. Soc. d'Études hist. et géogr. de Suez*, 1 (1950) 164 pp.; illustrations)

CONTRIBUTION À L'ÉTUDE PÉDO-BOTANIQUE D'UNE RÉGION DU HAUT-LOMAMI

By C. Kevers. (*Bull. agric. du Congo Belge*, 41 (1950) 256–360; maps and diagrams)

AN OUTLINE OF THE GEOLOGY OF KENYA

By S. M. Cole. $8\frac{1}{2}\times5\frac{1}{2}$. xiv+58 pp. Map and illustrations. *London: Pitman*, 1950. 6*s*

LA DÉCOUVERTE DE MADAGASCAR PAR LES PORTUGAIS ET LA CARTOGRAPHIE DE L'ÎLE, 1500–1667. (*Bol. Soc. Geogr. Lisboa*, 67 (1949) 517–634; maps)

THE BRITISH SETTLEMENT OF NATAL

By A. F. Hattersley. $8\frac{1}{2}\times5\frac{1}{2}$. viii+352 pp. Map. *Cambridge: Univ. Press*, 1950. 18*s*

MINERAL DEVELOPMENT IN SWAZILAND

By Peter Scott. (*Econ. Geogr.* 26 (1950) 196–213; illustrations)

THE ZULU PEOPLE AS THEY WERE BEFORE THE WHITE MAN CAME

By A. T. Bryant. $8\frac{1}{2}\times5$. xiv+770 pp. *Pietermaritzburg: Shuter*, 1949. 35*s*

An extensive study of Zulu civilization by a missionary who began work in South Africa in 1883.

AMERICA

MONTRÉAL: esquisse de géographie urbaine

By Raoul Blanchard. (*Rev. Canadienne de Géogr.* 4 (1950) 31–46)

MORPHOLOGIE LITTORALE DES ÎLES-DE-LA-MADELEINE

By Noël Falaise. (*Rev. Canadienne de Géogr.* 4 (1950) 63–80; sketch-maps)

GLACIER FLUCTUATION FOR SIX CENTURIES IN SOUTH-EASTERN ALASKA AND ITS RELATION TO SOLAR ACTIVITY

By D. B. Lawrence. (*Geogr. Rev.* 40 (1950) 191–223; maps and illustrations)

THE CLIMATE OF THE CENTRAL NORTH AMERICAN GRASSLAND

By J. R. Borchert. (*Ann. Assocn. Amer. Geogr.* 40 (1950) 1–39; diagrams)

GRASSLAND HISTORICAL STUDIES. NATURAL RESOURCES UTILIZATION IN A BACKGROUND OF SCIENCE AND TECHNOLOGY. VOL. I. GEOLOGY AND GEOGRAPHY

By J. C. Malin. $8\frac{1}{2}\times5\frac{1}{2}$. xii+378 pp. Illustrations. *Laurence, Kansas: The author*, 1950. $2.50

T.V.A. AND THE TENNESSEE VALLEY

By Charles McCarthy. (*Town Planning Rev.* 21 (1950) 116–30; illustrations)

THE INDUSTRIALIZATION OF THE BRITISH WEST INDIES

By W. A. Lewis. (*Caribbean Econ. Rev.* 2 (1950) 1–61)

THE GEOLOGY AND MINERAL RESOURCES OF JAMAICA

By H. R. Hose. (*Colonial Geology*, 1 (1950) 11–36; maps)

UN VIAJE POR EL AMAZONAS, 1947

By Vitoed de Szyszlo. 10×7. 28 pp. *Lima*, 1950

Includes observations on geology, climate, flora and fauna made between 1904 and 1945.

AUSTRALIA AND PACIFIC

SAND DUNES NEAR CASTLEREAGH, NEW SOUTH WALES

By D. S. Simonett. (*Australian Geogr.* 5, No. 8 (1950) 3–10; illustrations)

THE "YOBARNIE" METHODS FOR SOIL AND WATER CONSERVATION

By J. M. Holmes, P. J. Devery and P. A. Yeomans. (*Australian Geogr.* 5, No. 8 (1950) 15–22; illustrations)

Describes methods employed in reclaiming a property near Sydney, including contour ripping and contour tree-clearing.

ECONOMIC STRUCTURE AND THE CEREMONIAL EXCHANGE CYCLE IN ARNHEM LAND

By Donald E. Thomson. $8\frac{1}{2}\times5\frac{1}{2}$. 106 pp. Maps and illustrations. *Melbourne: Macmillan*, 1949. 12*s* 6*d*

TELL THE WHITE MAN: the life story of an aboriginal lubra

By H. E. Thonemann. $8\frac{1}{2}\times5\frac{1}{2}$. 190 pp. Illustrations. *London and Sydney: Collins*, 1949. 12*s* 6*d*

Mr. Thonemann, who took down this story, is the manager of a station on the Roper river, Arnhem Land, where the Mungari tribe live. He has known them for thirty years.

LA FRANCE DU PACIFIQUE

By J. Bourgeau. (*Terres Lointaines, VII.*) $7\frac{1}{2}\times5\frac{1}{2}$. 256 pp. Maps and illustrations. *Paris: Éditions géographiques*, 1950. 17*s* 6*d*

GENERAL

GRUNDFRAGEN DER ERDGESCHICHTE

By Georg Frebold. (*Kleine Länderkunden.*) $8\times5\frac{1}{2}$. 172 pp. Diagrams. *Stuttgart: Franckh'sche Verhandlung*, 1949. *DM*.6.80

The first part outlines the course of geological development, the second deals with geological forces and causes, including mountain building, volcanic phenomena, soil formation, etc. Many clear diagrams.

MORPHOLOGISCHE FORMENGRUPPEN IN IHRER BEDEUTUNG FÜR DIE JÜNGERE ERDGESCHICHTE

By Walter Behrmann. (*Die Erde, Berlin*, 1949–50, 238–66; diagrams)

LIMNOLOGICAL METHODS

By P. S. Welch. 9×6. xviii+382 pp. Illustrations and diagram. *Philadelphia: Blakiston Co.*, 1948. 56*s*

MINERAUX LOURDS ET PALÉOGÉOGRAPHIE

By Y. Guillien. (*Ann. de Géogr.* 59 (1950) 1–12)

MAP-READING FOR SCHOOLS

By Margaret Wood. New ed. revised. 10×7. 66 pp. Maps and illustrations. *London: George G. Harrap*, 1950. 6*s*

First edition 1939: now includes extracts from New Popular One-inch and Two-and-a-half-inch maps of the Ordnance Survey.

LA TIERRA HUMANIZADA

By L. Urabayen. 9½×6½. xiv+554 pp. Maps and illustrations. *Madrid: Espasa-Calpe*, 1949. [32*s*]

A systematic treatment of human geography.

THE PROPER STUDY OF MANKIND: an inquiry into the science of human relations

By Stuart Chase. 8½×5½. 288 pp. *London: Phoenix House*, 1950. 16*s*

DEGREES OF FREEDOM

By Gordon Manley. 8½×5½. 32 pp. *London: Christopher Johnson*, 1950. 3*s*

Professor Manley, in his inaugural lecture at Bedford College, commends to geographers "the doctrine of justification through works."

THE WHEEL'S KICK AND THE WIND'S SONG

By A. G. Course. 8½×5½. xiv+264 pp. Illustrations. *London: Percival Marshall*, 1950. 18*s*

The story of the "last surviving fleet of sailing ships registered in a British port."

ATLASES AND MAPS

WORLD

ATLAS INTERNATIONAL LAROUSSE POLITIQUE ET ÉCONOMIQUE. Publié sous la direction de Jean Chardonnet. 19½×13. 58 plates of maps, text and index. *Paris: Librairie Larousse*, 1950. *Distributed in Great Britain by George G. Harrap & Co., Ltd.* £7 7*s*

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